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## WP Management - Deliverable 1.1

### REAMIT Project Handbook

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Improving Resources Efficiency of Agribusiness  
supply chains by Minimizing waste using Internet of  
Things sensors (REAMIT)



## REAMIT Consortium

Organisation name	Country
University of Bedfordshire	UK
Images & Reseaux	France
University College Dublin	Ireland
University of Nantes	France
Levstone Ltd	UK
Nottingham Trent University	UK
Whysor	NL
Munster Technological University	Ireland
Cityzen Data (SenX)	France
Ulster University	UK
WD Meats	UK

## Abbreviations

Abbreviation	Full title
RSC	REAMIT Steering Committee
RAC	REAMIT Advisory Committee
RWP	REAMIT Work Package
NWE	North West Europe

FLC	First Level Control
LP	Lead Partner
eMS	Electronic Monitoring System

## Aim and Introduction

The aim of the REAMIT Project Handbook is twofold. First, it aims to guide partners in their joint implementation of the REAMIT project throughout its lifetime: from 11 January 2019 until 9 July 2023. Second, it aims to address partners' queries related to REAMIT decision-making, administrative and financial management, monitoring, reporting and control calendar and procedures.

The REAMIT Project Handbook is a living document – it grows with time as the implementation of the REAMIT project unfolds. With time, the Handbook will become a repository of information and good practice examples collected throughout the REAMIT project lifetime from individual experiences of REAMIT project partners, collective experience of the REAMIT partnership and feedback from the Joint Secretariat of Interreg NWE Programme.

The REAMIT Project Handbook is a deliverable under Work Package 'Project Management' and its development and updates are the responsibility of the Lead Partner. Nevertheless, all REAMIT partners are encouraged to co-develop this Handbook and suggest new themes to be covered so it becomes a handy and useful tool in daily work on project implementation.

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## **1. Responsibilities of the Lead Partner and Project Partners**

### **1.1 The Lead Partner Principle**

The REAMIT project is designed according to the Lead Partner Principle (LPP). The Lead Partner Principle is an important feature not only of Interreg NWE Programme but of all Interreg programmes. Under the LPP activities of the REAMIT project are carried out by 11 partners, of whom one partner, the University of Bedfordshire (BED), acts as the lead partner. The lead partner is a formal link between the project partners and Interreg NWE Programme as well as coordinates activities of all partners from all countries – United Kingdom, Ireland, France, Germany, and the Netherlands.

### **1.2 Responsibilities of the Lead Partner**

BED, the REAMIT project lead partner, can be considered the overall project manager. Other REAMIT project partners may have their own project managers to ensure that their share of the activities is delivered, but it is the lead partner who is responsible for making sure that all of the activities, timetables and budgets laid out in the approved REAMIT application stay on track, and for reporting on them to the programme. The lead partner is generally the only contact between the project partnership and programme management bodies. Interreg NWE Programme will have hundreds, if not thousands, of organisations working on projects. Communication with this large group is managed through the lead partners.

BED as the lead partner will play a key role in the REAMIT partnership building process and will lead the process of formulating objectives, project plan and structure of activities. The role of the lead partner also involves coordinating between project partners, keeping them involved and ensuring that their suggestions are taken on board.

Other formal responsibilities of BED as REAMIT lead partner are:

- Overall responsibilities for ensuring implementation of the whole REAMIT project in line with the approved application.
- Checking that all REAMIT project partners' expenditure has been validated by approved controllers. Ensuring that reported spending has been incurred through spending on the agreed activities only.
- Receiving payments from the programme and transferring funds to the other project partners without delay and without any deductions, unless these have been agreed in the project partnership agreement.
- Paying back to the programme immediately any amounts which need to be recovered due to irregularities detected after project end (before this, amounts to be recovered will be deducted from the next payment to the project). The LP then recovers these funds from the project partner which caused the irregularity. If the funds cannot be recovered from the partner, the Member State where the partner is located is liable.

These responsibilities are outlined in detail in the REAMIT Partnership Agreement and Subsidy Contract.

## 1.3 Responsibilities of Project Partners

All project partners are responsible for fulfilling their own tasks as described in the REAMIT application, and for ensuring that funds are only spent on the activities laid out in the application. The split of formal responsibilities between the lead partner and other partners in the project is defined below.

Table 1. Lead partner and partner responsibilities

Project stage	LP responsibilities	Project Partner responsibilities
<b>Financial contribution</b>	-Secures LP financial contribution.	-Secure financial contribution.
<b>Contract</b>	-LP signs the subsidy contract between the programme and the project. -LP draws up the project partnership agreement, including provisions for sound financial management and recovery of amounts unduly paid.	-The project partnership agreement must be signed by all project partners. They commit to delivering all approved outputs and activities and live up to financial responsibilities.
<b>Implementation</b>	-LP has overall responsibility for ensuring implementation of the whole project in line with the approved application.	-Every partner is responsible for carrying out the activities assigned to it in the application and project partnership agreement.



<b>Finance and reporting</b>	<ul style="list-style-type: none"> <li>-LP checks that all project partners' expenditure has been validated by approved controllers.</li> <li>-LP ensures that reported spending has been incurred through spending on the agreed activities only.</li> </ul>	<ul style="list-style-type: none"> <li>-Every partner is responsible for ensuring that their expenditure has been certified by the approved controller.</li> <li>-They should ensure as far as possible that certification and other documents are provided before the LP's deadline.</li> </ul>
<b>Payments</b>	<ul style="list-style-type: none"> <li>-LP receives payments from the programme and transfers funds to the other project partners without delay and without any deductions, unless these have been agreed in the project partnership agreement.</li> </ul>	
<b>Irregularities</b>	<ul style="list-style-type: none"> <li>-The LP is responsible for paying back to the programme immediately any amounts which need to be recovered due to irregularities detected after project end (before this, amounts to be recovered will be deducted from the next payment to the project). The LP then recovers these funds from the project partner which caused the irregularity. If the funds cannot be recovered from the partner, the Member State where the partner is located is liable.</li> </ul>	<ul style="list-style-type: none"> <li>-Every partner remains responsible and liable for any and all irregularities in the expenditure it has declared.</li> </ul>

## 2 Legal agreements

After REAMIT project had been approved, a legal agreement with Interreg NWE Programme has been signed (Subsidy Contract) and within the partnership (REAMIT project Partnership Agreement).

### 2.1 Subsidy Contract

As a successful project, REAMIT has signed a Subsidy Contract between Interreg NWE Programme's Managing Authority and the University of Bedfordshire i.e. the lead partner organisation. Much of the information in the Subsidy Contract is standard and covers the need to comply with programme, national and Community rules and regulations. A couple of features are worth stressing:

- The Subsidy Contract allows REAMIT project to carry out the approved activities, and the approved REAMIT application is normally attached as an annex to the contract. Any extra activities cannot therefore be carried out without the programme's advance approval.
- The Subsidy Contract contains REAMIT project budget details and almost certainly annual spending targets, again based on the information in the REAMIT application. REAMIT project is expected to meet these targets (or at least come close) and failure to do so may result in a cut in the grant to the REAMIT project (generally specified in another clause).

### 2.2 Partnership Agreement

REAMIT Partnership agreement is a contract signed between the lead partner and all other project partners. It states all duties and responsibilities of REAMIT project partners before, during and after project implementation. REAMIT Partnership Agreement is used as a reference document that describes the key roles and responsibilities of all partners. Putting key requirements on paper in a formal document required by the Programme increases the probability that partner organisations will take action to ensure that these responsibilities are fulfilled. REAMIT Partnership Agreement, REAMIT application form with financial annexes and the Subsidy Contract are key documents that should be considered together. They govern the REAMIT project partnership and outline roles and responsibilities of individual partners and the partnership as the whole in the implementation of the REAMIT project.

## 3. REAMIT Committees

### 3.1 REAMIT Steering Committee

At the REAMIT project Kick-Off Meeting (May 2019, Luton, UK) REAMIT partners have jointly decided that the REAMIT Steering Committee (RCS) will have the following members (Table 3). These members have to attend the meetings of RSC. In extraordinary circumstances when a member is not able to attend a RSC meeting, another member (well-informed about REAMIT) from the same institution can be deputised.

Table 3: Composition of REAMIT Steering Committee

PP1	BED	Ram Ramanathan (Chair)
PP2	I&R	Gael Maugis
PP3	UCD	Fionnuala Murphy
PP4	UoN	Gerald Thouand
PP5	Levstone	Simon McGraw
PP6	NTU	Usha Ramanathan
PP7	Whysor	Luuk Rijnbende
PP8	ITT	Gerard Corkery
PP9	SenX	Herve Rennou
PP10	UU	Joan Condell
PP11	DNI	Colin Potts

### 3.2 REAMIT Advisory Committee

REAMIT Advisory Committee (RAC) will consist of all associated partners as per Table 4 below. Associated partners should be invited by the members to which they are associated to.

Table 4: Composition of REAMIT Advisory Committee

Associated Partner	Invitation Responsibility
GIQS	BED
Oost NL	BED
Radboud Universiteit	BED
Terre d'essais	I&R
JEAN ROUTHIAU	UoN
Société Des Transports Européens Frigorifiques (STEF)	UoN
Biosearch NI	UU
Cottagequinn Farms LLP	DNI

### 3.3 REAMIT Committee meetings

The first meeting of the RSC, Work Package meetings and RAC meeting (hereafter called as RSC+WP+RAC meeting) will be held in Luton from 11am on 11 September, Wednesday, until 4 pm on 12 September (Thursday) 2019. This meeting requires attendance by all partners, sub-partners and associated partners. Sub-partners and associated partners should be invited by their corresponding project partners. It is normally expected that travel and subsistence of one person from each associated partner should be reimbursed by the corresponding project partner.

The following dates were agreed for the remaining six-monthly RSC+WP+RAC meetings. Partners are requested to block these dates.

- 15 and 16 January 2020 (to be hosted by I&R)
- 08 and 09 July 2020 (to be hosted by UCD)
- 20 and 21 January 2021 (to be hosted by Whysor)
- 07 and 08 July 2021 (to be hosted by Ulster University)
- 19 and 20 January 2022 (to be hosted by NTU)
- 23 and 24 March 2022 (to be hosted by BED)

All are Wednesdays and Thursdays in third week of January or second week of July to enable to submit the progress reports for the previous period (January – June or July – December) on time (except for the last meeting).

All partners should submit a progress report for the preceding period one month before the RSC+WP+RAC meetings to all project partners and the associated partners. The exceptions are the first and last meetings. For the first meeting, all partners should send progress report to LP in the second week of June 2019 and those wishing to submit financial claims should complete FLC and send this information to BED by the second week of August 2019.

The following is the suggested structure of the RSC+WP+RAC meetings:

- The REAMIT Advisory Committee (RAC) meeting, comprising all associated partners and project partners, will be held in the morning of the first day (11 am - 1 pm). The associated partners will assess the progress on the basis of progress report and provide guidance and suggestions to project partners at the RAC meeting.
- REAMIT Work Package (WP) meetings, chaired by WP leads and participated by all partners and sub partners, will be held during 2 - 6 pm.
- The REAMIT Steering Committee (RSC) meeting, with all project partners, will be held during 9 am - 1 pm on the second day. REAMIT progress reports will be finished at the end of the RSC meetings. The risk log will also have to be updated using the standard template provided by the JS.
- If needed, special meetings can be held in the afternoon of the second day. For the first RSC+WP+RAC meeting, a workshop on sensors and big data will be organised on the afternoon on 12 September. This will discuss a white paper prepared by technology partners (led by Levstone and Ulster) but may also have some technology demonstration by potential external companies willing to supply sensors for pilot tests.
- All partners are expected to complete financial audit of the expense claims by the First Level Controllers immediately after the RSC+WP+RAC meeting and confirm completion of their FLC to BED at least six weeks (i.e. by the second week of August and the second week of February) prior to the reporting deadline.
- BED will complete the actual project progress report and financials, arrange audit by FLC and will submit all document to the JS two weeks ahead of the reporting deadline (i.e. by the second week of September or the second week of March). The timelines are different for the first period.

### 3.4 Decision making by the REAMIT Steering Committee

As stipulated in REAMIT Partnership Agreement (Article 4) REAMIT Steering Committee is the key decision-making body in the REAMIT project. REAMIT Steering Committee takes decisions with regard to the:

- General project activities
- Individual project-related activities of Project Partners
- General project budget
- Individual project-related budget of Project Partners
- Request for the exclusion and addition of Partners

In any case, each Partner shall have a veto right for all decisions that may increase its financial participation in the Project or that may affect its legitimate interests. In case of a veto decision from the Partners affected, the question will be brought again to the Steering Committee in person or via electronic means as soon as possible. A second vote will take place and 90% of the voting Partners will have to be in favour of the decision. For this second round of vote, the affected Partners won't have a veto right.

At least seventy-five percent (75%) of Partners are required to attend the RSC to satisfy quorum. Decisions can only be made in the result of a majority vote, where eighty percent (80%) of the voting Partners are in favour of a decision. Each time the majority is not met, the RSC shall review the point(s) of disagreement within a period of one month. In the event that the RSC still cannot agree, the issue shall be submitted to the duly authorized representatives of the Partners.

RSC is composed of representatives from each Partner's institution. Each Partner's institution has one vote. Additional staff members from Partners or associated partners may attend the REAMIT Steering Committee as observers, but do not have a vote.

The REAMIT Steering Committee shall meet according to the agreed schedule with an agenda established by the chairperson. Members of the REAMIT Steering Committee may participate in the meetings remotely, with by teleconference means for example.

The chairperson of the REAMIT Steering Committee is the Lead Partner. It is responsible for drafting the minutes of each meeting. If no comments are received within fifteen days of sending the draft minutes, they shall be deemed approved by the Partners.

## 4. Monitoring the REAMIT project

### 4.1 Project monitoring tools

The aim of the REAMIT project monitoring is to ensure that the REAMIT project partnership delivers quality results and outputs on time and within the agreed budget outlined in the application. The lead partner and project manager are responsible for regular monitoring of activities carried out by all REAMIT partners. However, all REAMIT partners should also contribute to monitoring the activities carried out by the lead partner and other partners. The following tools shall be used for monitoring of activities carried out by project partners:

- a) Establishing project baseline for each reporting period based on the REAMIT application

Establishing project baseline for each reporting period is a starting point for tracking project progress across time and work packages. Project baseline will be verified at the end of each reporting period at RSC meeting. Partners will be asked to report on their contribution to the set baseline for the current reporting period.

#### **Example 1**

REAMIT partnership needs to approach four local public authorities in the reporting period Jan-June 2020 to present them the REAMIT project, its actions and expected results. At RSC meeting in July 2020, REAMIT partners need to demonstrate how they have contributed to achieving the set target and specify whom they have approached, when, at what occasion, what information was presented, in which form, what are the follow up actions resulting from establishing this contact with a local public authority and what the benefits are for the REAMIT project. As proof of this activity, partners need to keep records of email exchange or list of participants attending the meeting with a public authority in case this is requested by JS or FLC during audit or on the spot check at partner's premises.

- b) Defining what information is needed from partners and when

Each partner's (draft) activity report needs to be shared with all partners and associated partners approximately one month before the scheduled meeting of RAC, RWP and RSC. A reminder will be sent to all partners by the project manager in due time. Based on the information in partners' individual activity reports, project manager develops a consolidated (draft) REAMIT project activity report, which is shared with all partners and associated partners one week before the scheduled meetings of RAC and RCS.

Sharing of each partner's activity report with the rest of the partners enables all partners to familiarise themselves with activities carried out by each project partner, learn about what they have done and achieved

in the past six months, challenges they faced and ideas they have got. It also provides a platform where each partner can openly raise questions, express suggestions or concerns about the work of other partners. Monitoring of the REAMIT project simultaneously by the lead partner and project partners can be beneficial for the project since:

- Knowing about the actual progress of the project can be a powerful indicator for each individual partner indicating their own contribution and impact on the project progress.
- Feedback expressed by partners can stimulate generation of new ideas and improvements in the way the project is implemented.
- Can help foresee potential problems in good time and facilitate decision-making if corrective actions are necessary.

c) Monthly updates from each partner

Project manager needs to be updated about the activities and progress of each partner on regular basis i.e. once a month. For this reason, project manager will request via email an update from each partner about activities, challenges and plans for the next month. This communication will be done via email and partners are obliged to report to project manager within one week, also via email.

- d) Defining margins and the scope for variation that can be tolerated to achieve project objectives with the available resources.
- e) Documenting and communicating variation to partners (i.e., estimated and real progress).
- f) Deciding on a general approach about how to deal with different degrees of deviation from the plan (slight deviation within the scope, medium deviation at the limits of the scope, deviation outside the scope)

Points d-f will be developed.

g) Providing guidance and examples to partners about the content of their activity reports

Partners are requested to consult the REAMIT application each time they develop their activity report in eMS. REAMIT application contains a list of deliverables for each Work Package and names of partners who are responsible for each deliverable. When developing partner activity report, REAMIT partners are requested to be descriptive and write a story about what they have done in the past six months. In particular, their achievements, challenges, ideas how to address them, etc. Partners are also requested to include in their partner report information about other REAMIT partners who have contributed to their work and achievements. In this way partners highlight joint implementation of the REAMIT project.



### **Example 2**

*BED partner activity report, input to WP T1: Adapting and pilot testing sensor technologies in agri-food supply chains.*

Based on input from the University of Nantes, I&R and Valorial at first RSC meeting (Sept-2019, Luton, UK), BED had developed a power point template 'Pilot Tests Architecture', which shall be used by all pilot test leads to describe the pilot they lead.

Based on discussion at the first RSC meeting (Sept-2019, Luton, UK) and input from REAMIT partners, BED has developed input for the Pilot Test Road Map document. It was forwarded to I&R partner to support them in developing the Pilot Test Road Map.

Based on input from REAMIT Associated Partner (East NL Development Agency), BED with the help of NTU has developed an infographics presenting benefits for agri-food producer, transport and storage companies from participation in REAMIT Pilot Tests. The Open Challenge Call document has been updated accordingly and now includes a section articulating the benefits from participation in REAMIT pilot tests. It was presented to all REAMIT partners for feedback at the RSC meeting in Jan-2020 in Rennes, France.

BED has purchased Gateway and Sensor requested by Whysor to be used in the first Pilot Test in Germany. Both Gateway and Sensor were sent to Whysor and would be used in the pilot test in Germany in Jan-2020.

In Dec-2019 REAMIT PI from BED visited the sites of the first Pilot Test (Dungannon, UK) carried out by Ulster University and Dunbia. The schedule for the first pilot test was discussed and next steps agreed.

A White Paper on Sensors has been advanced by BED and in Dec-2019 it was sent for comments to REAMIT partners. Based on it a conference paper on sensors is being prepared.

## **4.2 Monitoring REAMIT project's risks**

Risks are internal or external events that may occur during project implementation and could threaten the achievement of project objectives and the project as a whole. A risk could be, for example, a partner dropping out or a key change in policy that goes against what the project is trying to achieve. Basic risk management is important for every project, but the level of detail needed varies depending on the size of the project and the number of risks and possible impacts on the achievement of the objectives. Identifying risks and outlining contingency measures for when they happen will be an important task for REAMIT partnership. In REAMIT this process involves three steps:

### **Step 1. Identifying risks**

To identify risks, REAMIT project partnership needs to look at possible sources of risk or at the threats / problems that can become risks. Sources include the team members, stakeholders, sub-contractors, target groups, end users, etc. Problems could be, for example, a change in the political environment or the loss of money through decommitment. A good way to identify relevant risks was an open brain-storming session at the first RSC meeting (September 2019, Luton, UK) which was very early on in the start-up phase. REAMIT team had then a brainstorming discussion on “*What can go wrong?*” All partners were involved in this process to a) raise their awareness about possible risks, and b) to identify as many relevant risks as possible (especially with reference to different countries, legislations, sectors, and types of organisations involved). In consequence, four new risks have been identified (risks 4-8) on top of the three risks (risks 1-3) listed in the REAMIT application. After consideration at the second RSC meeting (January 2020, Rennes, France), partners jointly decided to remove Risk 7 and 8 from the list of risks in REAMIT as they are outside the scope and control of the REAMIT project.

Risk 1: Technological risk related to adapting sensors and big data technology

Risk 2: Lack of companies participating in pilot tests

Risk 3: Lack of roll out potential

Risk 4: Effectiveness of sensors in providing genuine new information

Risk 5: Maintaining confidentiality of the sensor data on food quality from end users

Risk 6: Risk of not using the correct sensor for a given application

*Risk 7: Though we strive to reroute food before it becomes bad, there is risk involved as the food might become waste during rerouting.*

*Risk 8. Receiving stores do not want to accept food rerouted by REAMIT*

## **Step 2. Assessing risks**

Once potential risks have been identified, they are added to REAMIT risk log document and qualified according to their impact on the project and their probability of occurring. The assessment of probability is based on assumptions and educated guesses. Their impact, however, is estimated in relation to REAMIT budget and time lost or indicators not achieved. This assessment allows REAMIT project partnership to prioritise risks – the ‘high risk’ decisions and actions have to be taken first.

## **Step 3. Dealing with risks**

When a problem occurs, it is often too late to take any preventive or alternative actions. The project manager and partners concerned have therefore to decide in advance how to handle each risk while there is sufficient time. Possible approaches are:

*Ignore the risk*

This is sensible for risks with a low impact, or where the resources to develop alternatives would be greater than the impact of the problem, or if the probability is low but implications would be so substantial that the project cannot compensate for them anyway. *Example:* Natural disasters.

*Identify alternative ways to remove the risk.*

This is usually the approach to take for risks with high impact and high probability. *Example:* The project success depends on political support in all participating regions. It is known that the regional government in one of the participating regions could lose the regional elections that will take place in the middle of the project implementation. The possible new government will have different priorities and will probably not support the project.

*Have a contingency plan to reduce the impact of problems that do happen.*

This does not remove the risk but is a temporary solution. *Example:* The project developer has been the driving force behind developing the idea and bringing the partnership together. He/she is a key asset in the project. A plan must be made for the loss of this member of staff, ensuring that their knowledge and ideas are communicated to other people in the organisation so the project can continue without them, if necessary.

REAMIT partnership will review and monitor risks throughout the project lifetime to keep on top of them, as they might transform, or new ones might come up – *nothing is as constant as change!*

## 4.3 Monitoring REAMIT project's quality

REAMIT project quality means meeting expectations described in REAMIT application form and agreed by REAMIT partnership.

To be developed further.

## 5. Reporting and reimbursement process

REAMIT progress and financial reports as well as financial claims have to be submitted to JS every six months (January-June and July-December). REAMIT project report should be submitted to JS within three months after the end of the period. Thus, the reporting deadline for January – June period is 30 September, and the reporting deadline for July – December is 31 March of the next year.

Calendar for submission of partners' progress and financial reports and for LP submission of project report and payment claim:

### 5.1 First reporting period: January – June 2019

It is not compulsory for partners to claim for the first period (except for French partners who need to claim for all periods). Partners do not need to submit their financial claim for the first reporting period but have to submit their progress report. Thus, all partners are requested to submit their progress report by the end of July 2019 for the first reporting period (January-June 2019). These partners wishing to submit their financial claims should complete the audit by their FLC and submit this information to BED by the second week of August 2019.

- By 31 July 2019, partners submit their progress reports to LP
- By second week of August 2019 partners submit their FLC certificates to LP
- By mid September 2019 LP has completed FLC of the REAMIT project and submitted project report and payment claim to JS.

### 5.2 Second reporting period July – December 2019

All partners should submit a progress report for the preceding period one month before the RSC+WP+RAC meeting to all project partners and the associated partners.

- By 20 December 2019, each partner must have submitted their (draft) activity report to the lead partner, project partners and associated partners.
- By 16 February 2020, each partner must have submitted to the LP a full project report (activity, finance, audit, payment claim, and expenditure forecast for the next 6 months).
- By 23 February 2020, BED has completed drafting the second REAMIT report and submitted it to BED FLC.
- BED FLC confirmed their availability to carry out audit of REAMIT project on 24 and 25 February 2020.

- On 24 and 25 February 2020, audit of the REAMIT project takes place by BED FLC. In the week of 24 – 28 February 2020, all REAMIT partners are requested to be ready to promptly respond to LP in case of queries, clarifications and missing documents requested by BED FLC.
- By 28 February 2020, audit of REAMIT project has been completed by BED FLC.
- By 30 March 2020, BED has submitted second REAMIT project report to JS.

### 5.3 Third reporting period January – June 2020

All partners have submitted a progress report for the preceding period three weeks before the RSC+WP+RAC meeting (8 – 9 July 2020, hosted by Whysor, the NL) to all partners and the associated partners.

- By Friday, 12 June 2020, all partners have submitted their draft progress reports to LP, PPs and associated partners.
- By Friday, 7 August 2020, all partners have finalised their FLC audit and submitted their certified report to LP.
- On 16 September 2020, audit of REAMIT project starts at LP.
- By 29 September 2020, third REAMIT report and payment claim are submitted to JS.

### 5.4 Fourth reporting period: July – December 2020

- By Friday, 18 December 2020, all partners have filled in their activity report in eMS for the preceding period (July-December 2020). By this date, all partners have shared their activity report with partners and the associated partners.
- By Friday, 12 February 2021, all partners have submitted their certified progress report to LP.
- Early March 2021, BED FLC starts audit of the REAMIT project progress report and financial claim.

### 5.5 Fifth reporting period: January–June 2021

- By Friday, 18 June 2021, all partners have filled in their activity report in eMS for the preceding period (January-June 2021). By this date, all partners have shared their activity report with partners and the associated partners.
- By Friday, 3 August 2021, each partner has finalised in eMS their FLC audit and submitted to the Lead Partner the certified activity and finance report, payment claim, and forecast of expenditure for the next period.

- Early in September 2021, BED FLC starts the audit of the REAMIT project progress report and financial claim.

## 5.6 Sixth reporting period: July – December 2021

- **By Friday, 17 December 2021**, partners have developed their activity report in eMS and shared it with all partners and Associated Partners. To do so, you will need to print your report in PDF (function available in eMS) and share it with all Partners and Associated Partners by 17 December 2021.
- By **Friday, 11 February 2022** all partners have finalised their FLC audit and submitted to the Lead Partner their certified progress and finance report, payment claim, and forecast of expenditure for the next period.

## 5.7 Seventh reporting period: January – June 2022

- By **17 June 2022**, partners have completed the narrative part of their progress report in eMS and shared it as a PDF file with all REAMIT partners.
- By **15 August 2022**, partners have completed audits of their progress and finance reports.
- Audit of the REAMIT project progress report starts soon afterwards at BED.

## 6. Project Financial Management

On the programme level, once the funds are allocated to a project they are “locked” in that project and cannot be released until after project closure. This means that these funds cannot be used to get other projects started, and the funding is ‘parked’ and useless. As a result, the European Union has created a number of mechanisms to ensure that if money is committed but remains unused for a number of years, the projects and/or programmes concerned will have their budgets cut and lose all rights to the unused funds. These mechanisms (de-commitment and the spending targets in the Performance Framework) operate at programme level, but if programmes lose money because of projects failing to spend according to their budget they may well pass on these budget reductions to the under-performing projects.

This makes it essential that REAMIT project provides reasonably accurate spending forecasts. Spending under target because genuine cost savings have been achieved is of course a good thing. The problems to be addressed are bad budget planning and, as a result, asking for funding that will never be needed or used for the project: under-spending is most often the result of over-budgeting. It is also important to think about the realistic timing of expenditure. Experience shows that implementation in approximately the first quarter of the project is slow.

REAMIT lead partner has the overall responsibility for financial management, but each partner organisation must monitor its spending and keep its own records on expenditures for the project in question. The task for the lead partner is to make sure that project partners only report expenditure in line with their original budget, do not exceed the budget for different categories of costs, or claim costs under headings where they have no budget. In most cases, however, the eMS system should make this kind of basic mistake impossible.

### 6.1 Partner’s internal financial management and control system

It is worth to remember that:

- **FLC audit at partner organisation level can take as long as 3-4 weeks:** For this reason, it is advised that partners ‘book’ their FLC auditor at least one month in advance for audit of the partner report. In REAMIT first reporting round (January – June 2019) LP has observed that an auditor starts the audit of the partner’s report approximately three weeks after the report has been submitted to the auditor by the partner. This is because auditors have other audit commitments and partner’s report needs to ‘wait in a queue’ for its turn, if its time slot has not been booked in advance. For REAMIT second reporting round (July – December 2019) it is advisable to contact FLC early in December 2019 to ‘book’ the time slot for the audit of the report to start at the end of January/beginning of February 2020. Partners are advised not to leave it to the last minute, especially if this is the first time, they have audit carried out by the FLC. Many issues need to be clarified with the FLC auditor during the first-time audit, which can take as long as 4 weeks. Partners are advised not to cause a delay, as the LP is responsible for arranging the audit of the entire REAMIT project and completion of the procedure by end of March / end of September each year.

- One cost item needs to be reported under one Work Package and it cannot be split across different Work Packages. It is important however to alternate between Work Packages when reporting different cost items. For example, it is not possible to report all staff costs in one reporting period under WP T1 only.
- **Reporting language** in eMS is English only, also when reporting costs.
- **Staff cost description** should include the following information: Person (and position) employed, staff cost calculation method, month. Consult with you FLC if necessary.
- All partners need to provide sufficient level of information when reporting every cost item: name of the person; type of cost (e.g. travel), kind of ticket purchased (plane, train, etc.), activity the cost is related to, location of the activity, date of the activity.
- Staff costs should be distributed across WPs in every reporting period.
- Costs cannot be bundled up. This implies that for each cost item / transaction there is one entry, one line in eMS, one invoice or one pay slip.
- Staff timesheet template should be used for staff working part time on REAMIT.
- All partners need to report in eMS, even if they do not make a financial claim in a given reporting period.
- Target groups that each partner has reached should be reported in eEMS, e.g. local public authorities, regional public authorities, national public authorities, interest groups including NGOs, higher education and research, enterprises excluding SMEs, SMEs, business support organisations, sectoral agency. For more information about REAMIT target groups please consult the REAMIT Application Form (p.32).
- Every partner needs to identify their target groups and communicate directly to their target groups at least five times during each 6-month reporting period. Partners will be asked to report on their individual REAMIT related communication activities at each RSC meeting.
- All partners must observe public procurement rules of their organisation and the funder. According to the funder's rules<sup>1</sup>, for all contracts above € 5000 (excluding VAT) project partners (public or private) need to have documented proof that three quotes have been asked for. In the event that the partner must comply with other, stricter (internal) rules, these stricter rules apply.
- For contracts below EUR 5000, organisation's internal rules apply. Organisation's rules for public procurement may differ across organisations and countries. For example, for BED two quotes must be presented for all purchases where the value of the good or service is below £ 4000 (inclusive of VAT). When the value of the good or service is above £ 4000 (inclusive of VAT) and below £ 49999 (inclusive of VAT), three quotes in writing must be presented.

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<sup>1</sup> Interreg North West Europe Programme Manual 2014-2020, p. 96,  
<https://www.nweurope.eu/media/2686/programme-manual-final.pdf>



## 7. Changes in the REAMIT project partnership

In September 2020, the process of Dunbia and CF (Associated Partners) exiting and WD Meat (sub-partner of Ulster University) joining REAMIT has been completed.

From 1 January 2021, due to a merger of Institute of Technology Tralee (ITT) and CIT, Institute of Technology Tralee became Munster Technological University (MTU).

In November 2021, University of Essex became a sub-partner of the University of Bedfordshire.

## Annex 1. Minutes from REAMIT Steering Committee meetings

## Minutes of the REAMIT Kick-Off meeting held on 16/05/2019, Luton, UK

**RP<sup>2</sup> 19/01**

Present

Name	Institution	Name	Institution
Ram Ramanathan (RR)	<b>Chair</b> , BED	Davinder S Bola (DB)	Levstone
Tahmina Ajmal (TA)	BED	Usha Ramanathan (UR)	NTU
Charmaine Guyo (CG)	BED	LuukRijnbende(LR)	Whysor
Katarzyna Pelc (KP)	BED	Gerard Corkery(GC)	IT Tralee
Gaël MAUGIS (GM)	IMAGES & RÉSEAUX	Fabien Tencé(FT)	SenX
Fionnuala Murphy (FM)	UCD	Daniel Kelly (DK)	Ulster University
Ali Assaf (AA)	UoN	Bryan Gardiner (BG)	Ulster University
Simon Levstone (SL)	Levstone	Adrienne Gentil (AG)	Pole-valorial

Also attended for providing support from BED:

Samuel Van Ransbeeck

Ioana Stoica

Winifred Udende

Claudia Zugno

### **Welcome and Introduction**

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<sup>2</sup> RP refers to REAMIT Paper number. RM refers to REAMIT Minute number.

RM19.01.01 RR welcomed the attendees to the kick-off meeting, which started with refreshments. During this time, RR received signed PA from partners (except from Dunbia NI, who did not attend the meeting) and also distributed hard copy of letters informing all the partners about the approval of the project (except to Whysor as Luuk arrived late and to Dunbia NI).

RM19.01.02 RR introduced the project. This was then followed by short five-minute session by each partner introducing themselves, their organisation, what do they bring to the consortium, activities already started and immediate activities for the next 6 months. Presentations were made by RR, UR, DK, SL, FT, AA, GM, GC and FM. LR presented this information after the finance presentation by CG due to late arrival. Slides by these partners have been made available to all partners in REAMIT website.

### **Feedback and inputs based on the Project seminar in Lille**

RM 19.02.01 RR presented some important information discussed at the Approved Project Seminar in Lille on 11 – 12 April 2019. The notes have already been circulated to all partners. There was a query about whether the deadline will be delayed as the project effectively started in April not in January. RR explained that JS considers the project to have started in January and hence we had to follow the standard reporting procedures. Thus, the first reporting period is January – June 2019.

RM 19.02.02 There was a question about submitting claims for the first reporting period as it was not compulsory for partners to claim for the first period (except for French partners who need to claim for all periods). RR subsequently clarified this with JS that partners do not need submit their financial claim for the first period but have to submit their progress report. Thus, all partners are requested to submit their progress report by the end of July for the first reporting period (January – June 2019). Those partners wishing to submit their financial claims should complete the audit by their FLC and submit this information to BED by the second week of August 2019.

**Action: All partners to submit progress report and those wishing to submit financial claims to complete FLC on time.**

RM 19.02.03 There were queries about appointing FLC but this varies depending on the country. RR suggested that Programme Manual Version 9 should be consulted. CG also explained the process of FLC in her presentation subsequently.

**Action: All partners to appoint FLC ASAP as per the procedure in their country.**

RM 19.02.04 RR explained that REAMIT online interface in eMS at the implementation stage is distinct from the interface at the application stage. This means that all partners who wish to use the eMS for project management (submitting reports etc.) should be freshly registered. RR also noted that individuals managing REAMIT in some partner organisations are different at the implementation stage compared to the application stage. Hence, he asked all partners to send their registered email to him so that he can provide the read/write access or read only access depending on the need.

**Action: All partners to send registered email address to RR for getting access in eMS.**

RM 19.02.05RR asked all partners to send their bank details to BED (in a suggested template) as JS will send the claims only to BED, who will send funds to individual partners. Partners, in turn, will pay their sub-partners.

**Action: All partners to send their bank details to BED in the suggested template.**

### **Personnel Recruitment in all partner institutions**

RM 19.03 Recruitment of project personnel in partner organisations was then discussed. It was noted that BED will recruit a project manager and a big data hub research coordinator, NTU will recruit a communication manager, ITT will recruit a research assistant, and UCD will recruit a PhD student and a Postdoctoral researcher. These and other partners have been asked to complete the recruitments as soon as practicable. RR informed that there is limited opportunity to move funds within selected budget heads (up to 20%).

**Action: Partners to complete recruitment as per their requirements.**

### Finance training

RM 19.04.01 CG provided some details of financial issues, including appointment of FLC and data entry in eMS. More details are available in separate slides.

RM 19.04.02 Progress reports and financial claims have to be submitted every six months (January – June and July-December). The activities should be reported within three months after the end of the period. Thus the reporting deadline for January – June period is 30 September, and the reporting deadline for July – December period is 31 March of the next year.

RM 19.04.03 DB asked for a template of eliciting quotes for FLC. RR will send it after getting from CG.

**Action: RR to send the template for eliciting FLC quotes to all UK partners**

A networking lunch was organised for facilitating interaction and networking among partners.

### IoT Technology Demonstration

RM 19.05 The afternoon session started with the demonstration of IoT sensors by the GATEWAY Electronic Company (Gatewaycando.com) (represented by Keith Rogers and Tom Wright). They brought some sensors and routers and highlighted their capabilities. Some modern sensors are solar powered enhancing their utility in remote locations. They are distributors of sensors from a number of sensor manufacturers. RR has asked partners for their opinion in engaging them for providing sensors for pilot tests.

### REAMIT Operational Matters

RM 19.06.01 Since the second technology demonstration could not take place, RR then discussed the constitution of REAMIT Steering committee (RSC) and REAMIT Advisory Committee (RAC).

RM 19.06.02 It was decided that RSC will have the following members (Table 1). These members have to attend the RSC meeting. In extra ordinary circumstances when a member is not able to attend a RSC meeting, another member (well-informed about REAMIT) from the same institution can be deputed.

Table 1: Composition of REAMIT Steering Committee (RSC)

PP1	BED	Ram Ramanathan (Chair)
PP2	I&R	Gael Maugis
PP3	UCD	Fionnuala Murphy
PP4	UoN	Gerald Thouand
PP5	Levstone	Simon McGraw
PP6	NTU	Usha Ramanathan
PP7	Whysor	Luuk Rijnbende
PP9	ITT	Gerard Corkery
PP10	SenX	Herve Rennou
PP11	UU	Daniel Kelly until Joan Condell returns from maternity leave
PP12	DNI	Colin Potts

RM 19.06.02 REAMIT Advisory Committee will consist of all associated partners as per the Table 2 below. Associated partners should be invited by the members to which they are associated to.

Table 2: Composition of REAMIT Advisory Committee (RAC)

Associated Partner	Invitation Responsibility
GIQS	BED
Oost NL	BED
Radboud Universiteit	BED
Terre d'essais	I&R

JEAN ROUTHIAU	UoN
Société Des Transports Européens Frigorifiques (STEF)	UoN
Biosearch NI	UU
Cottagequinn Farms LLP	DNI

RM 19.06.03 RR mentioned that, based on the responses received from Doodle poll, the first meeting of the RSC, Work Package meetings and RAC meeting (hereafter called as RSC+WP+RAC meeting) will be held in Luton from 11 am on 11 September (Wednesday) until 4 pm on 12 September (Thursday). This meeting requires attendance by all partners, sub-partners and associated partners. Sub-partners and associated partners should be invited by their corresponding project partners. It is normally expected that travel and subsistence of one person from each associated partner should be reimbursed by the corresponding project partner.

**Action: Partners to send invitations to their sub-partners and associated partners to attend the next RSC+WP+RAC meeting and to all subsequent meetings.**

RM 19.06.04 The following dates were agreed for the remaining six-monthly RSC+WP+RAC meetings. Partners were requested to block these dates.

- 15 and 16 January 2020 (to be hosted by I&R)
- 08 and 09 July 2020 (to be hosted by UCD)
- 20 and 21 January 2021 (to be hosted by Whysor)
- 07 and 08 July 2021 (to be hosted by Ulster)
- 19 and 20 January 2022 (to be hosted by NTU)
- 23 and 24 March 2022 (to be hosted by BED)

All are Wednesdays and Thursdays in third week of January or second week of July to enable to submit the progress reports of the previous period (January – June or July – December) on time (except for the last meeting).

19.06.05 All partners should submit a progress report for the preceding period one week before the RSC+WP+RAC meetings to all project partners and the associated partners. The exceptions are the first and last meetings. For the first meeting, all partners should send progress report in the second week of June 2019 and those wishing to submit financial claims should complete FLC and send this information to BED by the second week of August 2019.

**Action: All partners to submit progress report (mandatory) and submit financial claims if needed.**

RM 19.06.06 The following is the suggested structure of the RSC+WP+RAC meetings:

- The REAMIT Advisory Committee (RAC) meeting, comprising all associated partners and project partners, will be held in the morning of the first day (11 am – 1 pm). The associated partners will assess the progress on the basis of progress report and provide guidance and suggestions to project partners at the RAC meeting.
- REAMIT Work Package (WP) meetings, chaired by WP leads and participated by all partners and sub partners, will be held during 2 – 6pm.
- The REAMIT Steering Committee (RSC) meeting, with all project partners, will be held during 9 am – 1 pm on the second day. REAMIT progress reports will be finalised at the end of the RSC meetings. The risk log will also have to be updated using the standard template provided by the JS.
- If needed, special meetings can be held in the afternoon of the second day. For the first RSC+WP+RAC meeting, a workshop on sensors and big data will be organised in the afternoon of 12<sup>th</sup> September. This will discuss a white paper prepared by technology partners (lead by Levstone and Ulster) but may also have some technology demonstrations by potential external companies willing to supply sensors for pilot tests.
- All partners are expected to complete financial audit of the expense claims by the First Level Controllers immediately after the RSC+WP+RAC meeting and confirm completion by their FLC to BED at least six weeks (i.e., by the second week of August or by the second week of February) prior to the reporting deadline.
- BED will compile the actual project progress report and the financials, arrange audit by FLC in early September and will submit all documents to the JS two weeks ahead of the reporting deadline (i.e., by the second week of September or by the second week of March).
- The timelines are different for the first period. Please see RM 19.06.05.

RM 19.06.07 The WP Long Term requires that a REAMIT Network event is conducted every year for the next three years. The following times were suggested. Exact dates will be decided by the hosting partner.

- January 2020 (to be hosted by NTU)
- October – December 2020 (to be hosted by I&R/Valorial)
- October – December 2021 (to be hosted by UCD)

RM 19.06.08 REAMIT Pilot tests are the most important activities in the first year of the project. An open challenge call has to be organised. As the lead of WPT1 Pilot Tests, I&R is preparing the details of the call. All partners are requested to provide their inputs and help maximise the recruitment of end-users using this call.

**Action: GM to prepare the open challenge call, and all partners to contribute to it.**

RM 19.06.09 The following is the approximate timeline for pilot tests.

- UU will conduct the first pilot test with DNI. Installation of sensors to be completed during September – December 2019.
- UU and DNI will jointly report preparations of this pilot at the RSC+WP+RAC meeting in September 2019.
- More tests are required. End-user has to be recruited using open challenge call. The following is a tentative schedule;
  - January 2020 (France – STEF?)



- April 2020 (Ireland – end-user to be recruited)
- July 2020 (Netherlands – Whysor to help in recruiting the end user)
- October 2020 (Germany – Whysor to help in recruiting the end user)
- More can be tried depending on interest of end-users

RM 19.06.10 Since there is some overlap in the expertise available in our technology partners (Whysor, Levstone, SenX and ITT), their roles and responsibilities for the pilot tests (WPT1) and big data analytics (WPT2) should be clarified. This will be discussed at the Sensors & Big Data workshop on 12 September. These partners are requested to discuss among themselves about allocation of responsibility and submit a joint document at the workshop.

**Action: Whysor, Levstone, SenX and ITT to submit a joint document on their responsibilities for all work packages.**

REAMIT in social media

RM 19.07.01 UR presented some details of REAMIT in social media. She introduced REAMIT website ([www.nweurope.eu/reamit](http://www.nweurope.eu/reamit)) and asked partners for suggestions in improving the website. She also introduced REAMIT's Twitter handle (@reamit4nwe), hashtag (#reamit4nwe), the Facebook page (<https://www.facebook.com/Reamit4nwe/>) and a Gmail ([reamit4nwe@gmail.com](mailto:reamit4nwe@gmail.com)). She requested all REAMIT related communications to include the Gmail so that the gmail account can act as a repository. She informed that photos take at the KO meeting will be uploaded in the Facebook page. RR asked for permission from partners for uploading the photos, and everyone agreed to it. All partners were requested to visit the Facebook page regularly and use the hashtag while tweeting REAMIT related matters. Suggestions for improvement were also solicited.

**Action: All partners to keep visiting REAMIT webpage, Facebook page, Twitter handle regularly, and use the hashtag while tweeting. Also send suggestions for improvement.**

RM 19.07.02 GM queried about using an exclusive website URL for REAMIT (e.g., [www.reamit.com](http://www.reamit.com) or [www.reamit.eu](http://www.reamit.eu)). Most partners supported the idea as it would give more credibility for the project. At the minimum, we could purchase the domain and redirect the URL to the existing website ([www.nweurope.eu/reamit](http://www.nweurope.eu/reamit)), but the website could also be used for project purposes (e.g., secured login for confidential sharing of data among partners). RR highlighted that JS does not encourage building a new website and will not be paying for the associated expenses. It was felt that buying a domain would be cheap. GM has been asked about purchasing a suitable URL.

**Action: GM to explore purchasing a URL for REAMIT.**

RM 19.07.03 UR asked all partners to keep sending small videos on the project to her regularly. She has budget to prepare a summary video of the project at the end. RR pointed out at this stage that videos should not be

uploaded in REAMIT website. Instead, they can be uploaded in external sites such as YouTube and a link can be included in REAMIT website.

RM 19.07.04 UR said that poster will have to be prepared and kept in the premises of each partner. She asked for suitable pictures from partner organisations. TA suggested that pictures on food would attract more end-users.

#### Project Management issues

RM 19.08.01 Development of a Project Handbook was discussed. All project related information and documentation (including this notes of the KO meeting) will be securely maintained in a University computer by the Project Manager. Partners have been requested to provide more suggestions for best practices for project management. Key control register was discussed.

RM 19.08.02 Risk register on key project risks & mitigation actions for each were discussed. RR pointed out that the REAMIT application outlined three risks (Risk 1: Technological risk linked to adapting sensor and big data technologies, Risk 2: Lack of companies participating in tests, and Risk 3: Lack of roll-out potential). It was agreed that these risks are relevant at this stage of the project. Other risks were elicited. The following additional risks were discussed by partners.

- Assignment of risk-ownership among partners
- Effectiveness of sensors in providing genuine new information
- Maintaining confidentiality of the sensor data on food quality from end-users. This requires that we install our own sensors to have direct access to the data. If external sensors are used, the data will first go to their platform before reaching the partners, which may breach the confidentiality of the data.
- Risk of not using the correct sensor for a given application. To minimise this risk, it is important to identify right sensors for a given purpose. For example, a sensor that works well with fish and a different kind of sensor may work well with fruits. DK suggested that a position paper or white paper on appropriate sensors for specific applications should first be developed. SL supported the idea and they jointly accepted to lead the development of the white paper. RR suggested it could be the first tangible output from the REAMIT project and requested that the white paper be prepared ahead of the workshop on Sensors & Big Data in September 2019.

**Action: DK, BG and SL to jointly lead the preparation of the white paper on sensors for discussion at the sensors workshop in Sep19. All partners to send their inputs to SL and DK.**

- Though we strive to reroute food before it becomes bad, there is risk involved as the food might become waste during rerouting. RR mentioned that the risk is likely to be low as the REAMIT project does not take ownership of the food and provides decision support only to the owners. Owners will be taking appropriate decisions on their food.
- Partners were asked to think about more risks and suggest them in the next meeting.

**Action: Partners to give their opinions on more risks to help develop a risk log.**

Any other business

RM 19.09 RR asked partners for any other business that they wish to raise. There was no other business. RR reminded Levstone to start working on the second Big Data platform that would collect data on food demand points (local convenience stores, food charities, etc.) along REAMIT corridors to enable these businesses to self-enrol.

**Action: Levstone to start the second Big Data platform for self-enrolling.**

Date for next RSC+WP+RAC Meeting

10.30 am on 11 September until 4 pm on 12 September 2019, Putteridge Bury Campus, University of Bedfordshire, Luton, UK.

The Kick-Off meeting ended with thanks from the Chair.

**RP 19/02 Matters Arising and Actions**

Date	Minute/ Item	Action	Responsi-bility	Update
		<i>Action identified, including referral to other committees</i>	<i>Member of staff with lead responsibility</i>	<i>Confirmation of completion or reasons for non-completion</i>
16/05/2019	RM 19.02.02	All partners to submit their progress report by the end of July for the first reporting period (January – June 2019). Those partners wishing to submit their financial claims should complete the audit by their FLC and submit this information to BED by the second week of August 2019.	All partners	Complete
16/05/2019	RM 19.02.03	All partners to appoint FLC	All partners	Ongoing
16/05/2019	RM 19.02.04	All partners to send registered email address to RR for getting access in eMS	All partners	Complete
16/05/2019	RM 19.02.05	All partners to send bank details to RR.	All partners	Complete
16/05/2019	RM 19.03	Partners to complete recruitment	RR, UR, FM, GC	Ongoing

16/05/2019	RM 19.04.02	RR to send the template for eliciting FLC quotes to all UK partners	RR	Complete
16/05/2019	RM 19.06.03	Partners to send invitations to their sub-partners and associated partners to attend the next RSC+WP+RAC meeting and to all subsequent meetings.	All partners	Complete
16/05/2019	RM 19.06.05	All partners should send progress report to RR in the second week of June 2019 and those wishing to submit financial claims should complete FLC and send this information to BED by the second week of August 2019.	All partners	Complete
16/05/2019	RM 19.06.08	GM to prepare the open challenge call, and all partners to contribute to it.	GM and all partners	Complete
16/05/2019	RM 19.06.10	Whysor, Levstone, SenX and ITT to submit a joint document on their responsibilities for all work packages	LR, SL, DB, FT and GC	Ongoing
16/05/2019	RM 19.07.01	All partners to keep visiting REAMIT webpage, Facebook page, Twitter handle regularly, and use the hashtag while tweeting. Also send suggestions for improvement	All partners	Ongoing
16/05/2019	RM 19.07.02	GM to explore purchasing a URL for REAMIT	GM	Complete
16/05/2019	RM 19.08.02	DK, BG and SL to jointly lead the preparation of the white paper on sensors for discussion at the sensors workshop in Sep19. All partners to send their inputs to SL and DK	DK, BG, SL and All partners	Complete
16/05/2019	RM 19.09	Levstone to start the second Big Data platform for self-enrolling.	SL and DB	Ongoing

**Minutes of the REAMIT RAC/WP/RSC meeting**  
**held on 11-12/09/2019, Luton (Putteridge Bury), UK**

**Present**

<b>Name</b>	<b>Institution</b>	<b>Name</b>	<b>Institution</b>
Ram Ramanathan (RR)	Chair, BED	Davinder S Bola (DB)	Levstone
Tahmina Ajmal (TA)	BED	Usha Ramanathan (UR)	NTU
Katarzyna Pelc (KP)	BED (only second day)	Luuk Rijnbende (LR)	Whysor
Gaël MAUGIS (GM)	IMAGES & RÉSEAUX	Gerard Corkery (GC)	IT Tralee
Sasha Bennett (SB)	NTU	Fabien Tencé (FT)	SenX
Yanqing Duan (YD)	BED (only for second day)	Daniel Kelly (DK)	Ulster University
Régis DEL FRATE (RF)	Pole-valorial	Simon McGraw (SM)	Levstone
Bryan Gardiner (BG)	Ulster University	FransHarren (FH)	Radboud University (only for the first day)
Shane Ward (SW)	UCD	JolineBrouwer (JB)	Oost NL (via Skype, only for the RAC meeting on the first day)
Gerald Thouand (GT)	UoN		

Apologies: Colin Potts (Dunbia Northern Ireland)

Also attended for providing support from BED:

- Samuel Van Ransbeeck (SR)
- Ioana Stoica (IS)
- Winifred Udende (WU)
- Claudia Zugno (CZ)

Welcome and Introduction

RM 19.10 RR welcomed the attendees for the 2-day long series of meetings. Progress report, agenda, and minutes from previous meeting have been distributed. All attendees introduced themselves very briefly.

#### REAMIT Advisory Committee (RAC) meeting

RM 19.11.01 The RAC meeting was attended by two RAC members – FH and JB.

RM 19.11.02 RR began the RAC meeting with a description of progress so far. A part of project recruitments has been completed. Social media accounts have been created. The first REAMIT Networking Symposium will be held in Nottingham on 9 January 2020. Since Oost NL sent their feedback ahead of the meeting, RR included the comments in a slide. Oost NL had suggested about strengthening the open call document to highlight the motivation for food transporters to participate in the project and creating an infographic about the end users experience. JB added more comments – revising the Open Call- so the end user can understand the benefits they would receive. JB advised she will come back with some communication to highlight the benefits to the end users.

**Action: JB to send more materials on communication to help strengthen the open call.**

RM 19.11.03 FH advised that he has contacts of businesses that would like to try these sensors in their trucks. Also, to contact insurance companies – big risk of loss for them with food waste. FH said that financial costs could be risky. RR suggested that all activities have to be evidenced clearly and be concise.

**Action: FH to suggest Dutch businesses that would try sensors in their trucks.**

RR thanked both the RAC members for their comments and promised that these comments will be considered in planning future project activities. He then closed the RAC meeting.

#### REAMIT Work Package (WP) meetings

RM 19.12.01RR started the WP meetings with some additional discussion on project progress. The first pilot studies are due to start in September with UU and Dunbia NI. Another UK pilot test is likely in the next few months. RR mentioned that the most recent IPCC report had some useful data that could be used to develop the framework for measuring the impact of REAMIT technologies on food waste. There are data in the report on carbon potentials of meat and plant-based diet, which could be used to estimate the savings in carbon emissions by saving certain quantities of meat or plant food.

#### WP T1 Pilot Tests meeting (Chair: GM)

RM 19.12.01 GM mentioned that the open call document has been published in REAMIT website in all the four languages and requested all partners to use the document and invite potential end users for pilot tests. He purchased the website domain ([www.reamit.eu](http://www.reamit.eu)) for the project. He and GT presented the current activities in France at the University of Nantes, using Raman Spectroscopy technology to monitor food quality. The first pilot in France is being carried out by UoN in co-operation with STEF and Jean Routhiau on chicken. GT expected that installation of their kit (Raman) and measurement will be done around May-June 2020.

Since Raman sensors provide more volume of data than traditional sensors, he needed full support from technology partners on transmission of the data in real time to the BIG DATA platform. RR requested technology partners to discuss these issues with GT regularly to avoid any last-minute issues.

**Action: GT and technology partners (Whysor, SenX, IT Tralee and BED) to work together on linking Raman spectroscopy sensors to the cloud to ensure success of the first French pilot test.**

TA asked GM and GT if they will continue to only use chicken for this study. GM advised that they have started with chicken and then move on to beef and seafood. GT explained that they wanted to use this technology in trucks, use samples of these meats for the study.

SM suggested that they are willing to allow University of Nantes to use their sensors in their trucks to provide assistance in collecting the data. RR also made a suggestion try other sensors from other suppliers in France.

RM 19.12.02 GM mentioned that another pilot test is being planned in France with UCPT, who are interested in participating using vegetables. The challenge is to be able to identify and be notified when the threshold temperature is reached. GM says if they are able to transmit the information real time that would be beneficial. RR requested technology partners to support this pilot test too.

**Action: SM and technology partners (Whysor, SenX, IT Tralee and BED) to work together on linking traditional sensors to the cloud to ensure success of the French pilot test.**

RM 19.12.03 DK described the progress on the first REAMIT pilot test being carried out with partner Dunbia. He informed that they are currently researching into VOC (Volatile organic compound) gas to detect changes in food quality. Also looking into if packaging affects food quality. They will use packaged meat vs unpacked meat and compare the two. Then, they will analyse the data to detect any differences. They still need to sort logistics and also to source the actual sensor to be used. Using electronic noses are useful in detecting the freshness of the food according to scent but the technology needs some manual intervention.

RR mentioned that, while the focus on VoC sensors is good and is the strength of the Ulster team, all pilot tests should have common minimum requirement in that traditional sensors (temperature/humidity/etc.) and GPS are fitted and linked to the cloud so that we can monitor a measure of food quality remotely and continuously.

**Action: All partners to ensure that pilot tests have the common minimum requirement.**

DK discussed the sensor's requirements and the cost of other sensors. Progress has been slow but he was confident on making more progress in the next month. RR mentioned that technology partners would like to be involved in the design of this pilot, and can make a visit to Ulster if needed.

**Action: DK to make more progress on the pilot test by meeting with Dunbia ASAP and inform RR and other partners a potential date for visiting the pilot test site.**

RM 19.12.04 LR presented the progress of pilot tests in the Netherlands and Germany. He mentioned about starting a German pilot test soon. They will keep looking for a potential participant for Dutch pilot studies. RR expressed willingness to be involved in designing the German pilot (as also all other pilot tests).

**Action: LR to provide more information about German pilot test (including details of the participating company) and a timeline soon.**

RM 19.12.05 SW presented progress on starting the Irish pilot test. He said the Irish pilot will use the Cyberbarsystem. This enables you to track and trace the process of the food from the farm to the consumer's kitchen. Place a QR code onto the food item, tamper proof. The label is embedded in the product, so not a part of the packaging. Using a QR reader you can scan the food item to trace the origin of the food. He expected that the Irish pilot will start inspring/summer 2020. RR advised that all partners work with UCD to support them with this new venture.

**Concerns raised:** TA argued that she did not find the concept of imprinting barcodes on edible food comfortable from a personal perspective, however SW stated many inventions were initially considered unethical but have now become the norm e.g. bottled water.

WP T2: Big data Analytics (Chair: BED)

RM 19.12.05 RR introduced the progress in WP T2 but highlighted that there was not much scope so far to make a good progress as WP T2 activities are contingent up on the progress of WP T1. However, there were some activities conducted as part of this work package such as purchase of the Big Data server in BED and the mini IoT platform by Levstone. DB discussed their mobile framework- mini pilot test running/IoT platform. They will be working on database with raw data, they have created a passkey to get data into the cloud. They are currently considering various approaches to data analytics. RR pointed out that one of their activities, of developing a web-interface with self-enrol facility for enrolment of potential suppliers and consumers of food produce (Activity T2.5.3 in the application form) could be started without waiting for any previous activities in WP T1. This is a database based on Google maps.

**Action: BED to procure the Big Data Server. SM and DB to develop a database using Google maps to detect where trucks are moving.**

A suggestion was made that it would be better to carry out the analysis at the source and what you are sending is just the results of the data. This would reduce the size of the data. This may be tested when possible.

WP T3: Business models (Chair: Ulster)

RM 19.12.06 The discussion on activities on WP T3 has been postponed until next RSC meeting as there is no activity is scheduled for the previous reporting period.

WP LT Long Term (Chair: BED)



RM 19.12.07 RR discussed rolling out REAMIT Technologies to be used in other companies and to roll this out to other industries such as pharmaceutical industries. He reminded partners that the first REAMIT networking Symposium has been finalised in Nottingham for 9 January 2020. He requested an active participation of all partners for the first symposium by showcasing their products and making presentations, not only on their involvement in REAMIT but also on all other related activities that are being carried out by them. He also requested all partners to provide maximum publicity to the event in their networks and ask several of their contacts to attend the event. They can organise stalls, technology demonstrations, special tracks and workshops, for example. RR requested partners to send details of their participation including stalls, demonstrations, tracks and workshops to UR to help prepare an impressive promotional material that would help attract more audience to the symposium.

RR also reminded about the other two REAMIT symposiums scheduled in France (IR and Valorial) in Oct-Dec 2020 and in Ireland (UCD) in October – December 2021.

**Action: All partners to send details of their presentations, stalls, demonstrations, tracks and workshops to UR to help prepare impressive promotional materials. They need not be fully linked to REAMIT and can be on related activities too.**

RM 19.12.08 RR reminded partners about another activity (LT.2.1) in WP LT, which is the development of an agreed framework for measuring the impact of REAMIT technologies on food waste. He reminded that the data from IPCC could be used to supplement the data from WRAP's Fusion Project report for the purpose.

**Action: RR, KP, YD and TA to produce the framework for measuring the impact of REAMIT technologies on food waste.**

WP M Project Management (Chair: BED)

RM 19.12.06 RR announced that new Project Manager Katarzyna Pelc (KP), known as Kate, would be joining from 1st October 2019. She was expected to meet the partners on the second day. KP has started developing a project handbook, which would be made available on the REAMIT website. He requested all partners to give suggestions on best practices in managing the project handbook, internal management systems and risk-log.

**Action: All partners to suggest best practices in Project management, handbook, internal management systems and the risk log.**

WP Communication (Chair: NTU)

RM 19.12.07 UR introduced the new Communication Manager, SB. She presented a draft version of the communication strategy and requested support from all partners to update the strategy.

UR discussed the social media strategy:

- Social media posting- at least once a week, mainly Fridays- Likes and comments on social media are needed to expand the audience

- Discussed the new design for the roll up.
- Newsletter, videos, flyers will be made in preparation for our event in January 2020.

Partners pointed out that images cannot be uploaded on the Interreg website due to the file size limitation of 10MB. SB suggested uploading them onto the various social media platforms, linking these sites to the website. RR further requested all partners to follow REAMIT (@reamit4nwe) in Twitter and join the Facebook group (<https://www.facebook.com/Reamit4nwe/>). The REAMIT roll-up was kept at a central place in the venue and RR informed all partners that a similar roll-up should be kept prominently at the premises of all partners.

**Actions: (i) All partners to send their inputs to REAMIT Communication Strategy document; (ii) All partners to follow REAMIT (@reamit4nwe) in Twitter and join the Facebook group; (iii) All partners to produce a REAMIT roll-up and keep it prominently in their premises.**

RM 19.12.08 SB pointed out that it is a requirement that all partners feature REAMIT project in their organisational websites so as to raise more awareness across NWE. She also requested all partners to send any posts they would want to promote on the REAMIT social media pages. She further requested partners to send suitable images (without infringing any copyright) for use in REAMIT website; the current photo represents just freshness but we need more variety of pictures, including trucks that implement REAMIT sensors, Raman spectra, and more that represent technology.

**Actions: (i) All partners feature REAMIT project in their organisational websites; (ii) All partners to send any posts they would want to promote on the REAMIT social media pages; (iii) Partners to send suitable images (without infringing any copyright) for use in REAMIT website.**

RM 19.12.09 UR discussed target groups for the project, including policy makers and local councils. As the organiser of the first REAMIT Networking Symposium, she extended a warm welcome to all partners to attend the symposium in Nottingham on 9 January 2020 and requested full support to get participants from all over Europe.

**Actions: All partners to support UR in successfully organising the first REAMIT Networking Symposium in Nottingham on 9 January 2019.**

REAMIT Steering Committee (RSC) meeting

RM 19.13.01 Since RAC meeting and WP meetings concluded earlier than scheduled, it was felt that a part of the RSC meeting could be discussed depending on the availability of time.

RM 19.13.02 The minutes of kick-off meeting was circulated. RR went through the draft minutes from last meeting for confirmation. The following changes were highlighted by partners:

- GT raised a query on RM 19.06.02 because he may not be able to attend all the RSC meetings. RR highlighted the information in the same paragraph that in extra ordinary circumstances when a

member is not able to attend a RSC meeting, another member (well-informed about REAMIT) from the same institution can be deputised.

- Some partners queried about RM 19.06.10 as it has not been possible for partners to discuss the allocation of responsibility. It was decided to discuss this in detail after the Sensor & Big Data workshop on the next day.

With these queries, the minutes of the Kick-off meeting have been confirmed as accurate by the RSC.

RM 19.13.03 RR discussed the action log to follow the actions assigned to partners. Some actions had not yet been completed as highlighted below.

RM 19.13.04 The action, RM 19.02.03 - All partners to appoint FLC, had not been completed as Levstone and NTU had not yet appointed their FLC. They needed further information about potential auditors to approach. RR promised to send relevant details to the two partners.

**Action: Levstone and NTU to appoint FLC soon and RR to send relevant details to the two partners.**

RM 19.13.05 The action, RM 19.03 - Partners to complete recruitment, had not yet been completed. RR urged all partners to complete recruitment in a timely manner.

**Action: Partners to complete recruitment of project personnel.**

Actions RM 19.06.10 and RM 19.09 were discussed earlier in the WP or RAC meeting on the day. All other actions were considered complete though some are ongoing activities.

RM 19.13.06 RR went back to the feedback from the RAC so far, commented that Oost NL had some very valid points and their comments should be carefully considered. BED will work on revising the open challenge call document, but all partners were requested to contribute.

**Action: BED team will revise the open-challenge call in line with the feedback of RAC and all partners should also contribute.**

RM 19.13.07 SM suggested that a strategy of disseminating information to end users should be developed in order to create more awareness. UR highlighted that it would be part of the Communication Strategy.

RM 19.13.08 GT suggested that it would be good idea if a survey is held with prospective end-users about the potential barriers in joining as an end-user in REAMIT. This survey would help understand the expectations from end-users and hence help revise the open challenge call and target correct end-user. A lengthy discussion took place and it was concluded that a short survey of 10 question could be distributed to attendees of the symposium. This could also be tested by partners in different countries. Since the time was running out, it was decided to discuss this further on the next day.

*~Close of meeting~*

## **Day 2 – 12 September 2019**

RM 19.13.09 RR welcomed the partners for the second day of the meeting. RR introduced KP to all partners as the new REAMIT project manager. He asked KP to talk about risks.

RM 19.03.10KP highlighted the need to be aware of risks and to make advanced preparations anticipating them. She presented the Risk log, highlighting the 3 main risks:

1. Lack of roll out potential
2. Lack of company's participating in tests
3. Technological risk linked to adapting sensor and big data technologies.

She then presented the following additional potential risks at this stage of the project:

4. Effectiveness of sensor in providing genuine information;
5. Maintaining confidentiality of the sensor data on the quality of food;
6. Risk of not using the correct sensor for a given application.

Partners discussed these risks in detail. RR highlighted that there is progress in identifying levels of risks for end users through carrying out the pilot tests, but we need to explore further. GC suggested once we have collected the data, we will be able to have proof of concept.

RM 19.03.11 GC queried about the volume of food that needed to be monitored to have an idea of the impact of food waste. Need to focus not just on transportation, but also on waste of food. There will be moments when these two goals conflict and necessarily need to prioritise one or other – yet important to focus on both. RR agreed on need to focus on both waste of food and transportation – ideal case would be to find a company that does both food and transport.

SM reiterated that these pilot tests are the prototypes, so distributing the tests along the timeline of the project, will reduce the risks. SM suggested that the end users need to be carefully managed - customer relationship to understand the customer's journey and get feedback.

RM 19.03.12 The idea of a mini survey discussed in the previous evening (RM 19.13.08) was further discussed. RR wondered whether it would be meaningful to send the 10-question survey to potential end-users available to all partners as this could sometimes discourage potential end-users. It was felt that this would be a risky move. GM suggested that first we need to identify 5 end users who are meaningful and find out their expectations. RF suggested it might be difficult as this project is completely new to clients. DB suggested to list Top 3 things the end users would want addressed in the survey. TA felt there might be some restrictions with this survey, adding that it might be too soon as there aren't any tangible cases and for the first pilot to go ahead.

RM 19.03.11 GM suggested that it would help if all partners leading pilot testing produced the ongoing report from their pilot test to update all partners. The LP (BED) could develop a template to be used by all pilot

leaders. Template would be sent to all pilot leaders ASAP. Partners would need to send out this report filled in to all PPs to share information with them regularly and at next REAMIT meeting we would discuss it:

1. Aim of the pilot
2. Calendar of the pilot
3. challenges during the pilot
4. recovery plan from challenges

GM further suggested that LP develops a Power Point template to be filled in by all leaders of pilot tests. Power point slide produced for all pilots would then be used to exchange information with all partners about pilots they are carrying out. The flow of information on the PP graph could be this:

**Sensors -> Data -> Cloud ->Data -> Data analysis -> Data Bank ->Yes ->Alert (Decision support system) ->No**

SM suggested GM and other partners in France who have the experience with the end users, to ensure this first piece of communication is approved by them before sending it off.

**Action: BED to develop a template on the architecture of pilot tests for partners to follow uniformly.**

RR reminded partners about the next RSC meeting: in France 15 – 16 January 2020. These dates have been decided at the kick-off meeting. The RSC meeting after this would be held in UCD on 8 and 9 July 2020.

RM 19.03.12 RR reminded partners about project report and financial claims (after getting approval from their FLC) for the preceding period, and financial forecast for the next period. This should be submitted in eMS every 6 months. In order to provide sufficient time for the LP to submit the overall project report, financial claims and financial forecasts, all partners need to submit their details within six weeks of the end of the preceding period. This will help ensure that the LP submits the details on time and get paid. For the current period ending December 2019, all partners were requested to submit their progress report, financial claims and forecast by 15 February 2020. This will help LP to organise FLC approval and submit well before the end of March 2020.

RR officially closed the RSC meeting.

Sensors & Big Data workshop

RM 19.14.01 The workshop started with two technology demonstrations.

RM 19.14.02 The first demonstration was made by Peter Marchant from Review Display Systems Ltd. and Šimon Chudoba from IQRF Alliance. They specialise in developing specialised and generalised sensors. An example of sensors installed in an airport in Prague was given, whereby the installation period took only six hours as opposed to six months. The sensors were installed in hospital freezers where medicines were kept in order to ensure that the right temperature was maintained. The sensors measured things like CO<sub>2</sub>, temperature etc. results were uploaded unto the cloud devices through a gateway at regular intervals. The presentation elicited interest from several partners, who engaged in further discussions with IQRF. RR

requested interested partners to engage with the IQRF team on further activities and keep all partners updated.

RM 19.14.03 The second demonstration was made by SR on an aquaculture project being carried out by BED with partners in Brazil. Sensors made by a British Company called Seneye were installed into ponds to detect their PH value, light, temperature etc. The data gets uploaded on the cloud devices which could be assessed using an app. SR showed the measurements on a real time. The presentation was requested by RR to show the ability to upload real time information on the cloud that will facilitate further real-time analytics.

RM 19.15.01 Draft of a white paper titled “Review of Potential Sensor Technology for Continuous Monitoring of Food Quality in Transport” has been prepared by Partners in Ulster University with further inputs from Levstone and ITT. This was discussed at the workshop. It was highlighted that the white paper should be improved further with inputs from all the partners, and should form the basis for selection of sensors for pilot tests. When the paper is sufficiently improved with practical insights from pilot tests, it should be submitted to a suitable journal. RR requested all partners to add more information to the document.

**Action: All partners to contribute to the sensors white paper with insights from their previous experience and experience of conducting pilot tests.**

RM 19.15.02 The role of technology partners (SenX, Whysor, ITT, BED and Levstone) was further discussed. Whysor expressed interest in being involved mainly with connecting sensors to the cloud but not much in the analytics stage. Other partners have expertise in conducting business analytics, though Levstone has expertise to contribute to more REAMIT activities (e.g., the second database on locating nearest demand points and the Smartphone APP). It was decided that the data collected from sensors would be made available to SenX, ITT, BED and Levstone to conduct independent analysis and the sharing the results. This is because the same data can provide multiple insights depending on how it is analysed. The partners can then decide about how to prepare a joint report collating all these results.

RM 19.15.03 DK has raised a question regarding authoring scientific publications based on the REAMIT project. It was agreed that names of all persons who have contributed to a specific task(s) leading to the scientific publication would be mentioned as authors of this publication.

RR closed the Sensors and Big Data workshop although technical discussions were continued by members on the schema for pilot tests. A template for pilot tests resulted from these discussions as shown in the Box below.

## Box: Technical Details of Pilot Tests

- First pilot test will be carried out by Ulster with Dunbia as the end-user. DK and Colin Potts in Dunbia will lead this pilot. Data collection will continue throughout the pilot test, until March 2020. Minimum amount of data collection to conduct data analysis will be achieved by January 2020.
- VOC sensors, temperature and humidity sensors will be purchased with support from Levstone and Whysor. These sensors will be connected to cloud to collect data.

### **A Schema of Activities of first pilot test:**

- Dunbia will fix the sensors. Levstone and Whysor will get quotes for sensors.
- These sensors will be attached to black boxes and put in trucks (Ulster will decide this operation)
- Ulster, IT, Bed, Dunbia and SenX will do data analysis.
- WARPIO software will be used by SenX. But data needs cleansing before analysis. Data from cloud will be downloaded to use in csv form.
- Progress will be updated by Dunbia.

### **Main conversation**

- RR: All pilot tests to run until end of the project
- DK: it is difficult to overrun after 3 months; as pallets will finish their life or change, so it is difficult.
- DB: We will discuss and continue to work beyond 6/7 runs.
- FT: Data will be generated only after five runs.
- RR: Need to have more pilot tests
- **Second pilot** test will be in Germany by Whysor (LR)
- Third pilot test will be in June 2020 in France by UoN (GT) with Raman Spectrography
- Another French pilot test by I&R (GM) by 16 Jan 2020
- Ulster will be conducting another pilot test for testing 3D Fluorescence spectrometers

### **Proposed plans:**

- VOC sensor will be used by DK.
- Whysor will also help to source sensors along with DB for VOC and Co2 sensors.
- Quotes for Temp and Humidity sensors will be obtained by LR and DB for two different sets of sensors.
- Daniel will buy both the types and send them to DB and LR respectively. DB and LR will fix the sensors in box and send back to DK.
- Same boxes (that house sensors and fitted on to pallets) will be used for all pilots.
- Email quotes for sensors will be obtained by DB and LR. This will be evidence for Interreg.

### **Conversation**

- KP: Procurement policy is to be checked to verify simple way to get quotes
- RR: Quotes for all sensors including light VOC, Co2, GPS, temp, humidity will be obtained
- KP: How will achievement of REAMIT objectives be evidenced? (by photos)
- Provide decision support – threshold should be put for temperature. All pilot test will feed into this to provide support and evidence.
- DK and GC: Temperature can be monitored. VOC can do more.

### **REAMIT targets:**

- At least 5 solutions will be tested and prototyped.

## Matters Arising and Actions

Date	Minute/ Item	Action	Responsibility	Update
		<b>Action identified, including referral to other committees</b>	<b>Partner(s) with lead responsibility</b>	<b>Confirmation of completion or reasons for non-completion</b>
11/09/2019	RM 19.11.02	JB to send more materials on communication to help strengthen the open call.	Oost NL (JB)	Complete
11/09/2019	RM 19.11.03	FH to suggest Dutch businesses that would try sensors in their trucks	FH	FH to be contacted by Whysor
11/09/2019	RM 19.12.01	GT and technology partners (Whysor, SenX, IT Tralee and BED) to work together on linking Raman spectroscopy sensors to the cloud to ensure success of the first French pilot test.	GT and technology partners (Whysor, SenX, IT Tralee and BED)	Complete
11/09/2019	RM 19.12.02	SM and technology partners (Whysor, SenX, IT Tralee and BED) to work together on linking traditional sensors to the cloud to ensure success of the French pilot test	SM and technology partners (Whysor, SenX, IT Tralee and BED)	Not needed
11/09/2019	RM 19.12.03	All partners to ensure that pilot tests have the common minimum requirement that traditional sensors (temperature/humidity/etc.) and GPS are fitted and linked to the cloud so that we can monitor a measure of food quality remotely and continuously.	All partners	UoN does not need GPS as it is lab tested  Accepted
11/09/2019		DK to make more progress on the pilot test by meeting with Dunbia ASAP and inform RR and other partners a potential date for visiting the pilot test site	DK, Dunbia	Complete
11/09/2019	RM 19.12.04	LR to provide more information about German pilot test (including details of the participating company) and a timeline soon	LR	Complete



11/09/2019	RM 19.12.05	BED to procure the Big Data Server.	BED	Ongoing  BED is waiting for senior research fellow to join BED.
11/09/2019		SM and DB to develop a database using Google maps to detect where trucks are moving.	Levstone	Ongoing  SM to send BED information
12/09/2019	RM 19.12.07	All partners to send details of their presentations, stalls, demonstrations, tracks and workshops to UR to help prepare impressive promotional materials.	All partners	Ongoing
12/09/2019	RM 19.12.08	RR, KP, YD and TA to produce the framework for measuring the impact of REAMIT technologies on food waste	RR, KP, YD and TA (BED)	Complete
12/09/2019	RM 19.12.06	All partners to suggest best practices in Project management, handbook, internal management systems and the risk log,	All partners	Complete
12/09/2019	RM 19.12.07	All partners to send their inputs to REAMIT Communication Strategy document.	All partners	Complete
12/09/2019		All partners to follow REAMIT (@reamit4nwe) in Twitter and join the Facebook group.	All partners	Complete
12/09/2019		All partners to produce a REAMIT roll-up and keep it prominently in their premises.	All partners	Complete
12/09/2019		All partners feature REAMIT project in their organisational websites.	All partners	Ongoing  NTU to send a template to PPs
12/09/2019		All partners to send any posts they would want to promote on the REAMIT social media pages.	All partners	Complete

12/09/2019		Partners to send suitable images (without infringing any copyright) for use in REAMIT website.	All partners	Complete
12/09/2019		All partners to support UR in successfully organising the first REAMIT Networking Symposium in Nottingham on 09 January 2019.	All partners	Complete
12/09/2019	RM 19.13.04	Levstone and NTU to appoint FLC son and RR will suggest sending relevant details to the two partners.	Levstone and NTU	Complete
12/09/2019	RM 19.13.05	Partners to complete recruitment of project personnel.	Relevant partners	Ongoing
12/09/2019	RM 19.13.06	BED team will revise the open-challenge call in line with the feedback of RAC and all partners should also contribute	BED	Ongoing I&R – French version Whysor – German and Dutch version
12/09/2019	RM 19.13.11	BED team will revise the open-challenge call in line with the feedback of RAC and all partners should also contribute.	BED	Complete
12/09/2019	RM 19.15.01	All partners to contribute to the sensors white paper with insights from their previous experience and experience of conducting pilot tests	All partners	Complete

## Minutes of the REAMIT RAC/WP/RSC meeting held on 15-16/01/2020, Rennes, France

Present:

Name	Institution	Name	Institution
Ram Ramanathan (RR)	Chair on Day 2 – BED	Ali Assaf (AA)	University of Nantes
Katarzyna Pelc (KP)	Chair on Day 1 – BED	Gerald Thouand (GT)	University of Nantes
Gérard Le Bihan (GLB)	I&R Day 1 only	Emilie Grange (EG)	University of Nantes
Darin Beach (DB)	I&R	Gerard Corkery (GC)	IT Tralee (Attended the meeting on Day 1 afternoon via video link)
Sasha Bennett (SB)	NTU	Pratheepan Yogarajah (PY)	Ulster University
Usha Ramanathan (UR)	NTU	William Duffy (WD)	Ulster University
Régis DEL FRATE (RF)	Valorial	Shane Ward (SW)	UCD
Blandine Fortin	Valorial	Imke Hermens (IH)	Whysor
Simon McGraw (SM)	Levstone	Fabien Tencé (FT)	SenX

Apologies:

Tahmina Ajmal (BED)

Gael Maugis (I&R)

Yanqing Duan (BED)

### Welcome and Introduction

KP opened the meeting and welcomed the attendees for the 2-day long series of REAMIT project meetings. GLB also welcomed the attendees in the premises of I&R. KP invited all attendees to introduce themselves and went through key points of the agenda. Agenda and minutes from previous RSC meeting were distributed in the seminar pack.

### REAMIT Advisory Committee (RAC) meeting

RM 20.01.01 KP presented feedback received from Joline Brouwer (JB) from East NL Development Agency (REAMIT Associated Partner associated to BED) on the draft REAMIT progress report for the period July-December 2019. Since JB sent her input ahead of the RAC meeting, KP included the comments in a slide. In summary, East NL Development Agency were pleased with REAMIT project progress so far. She commended the Communication part of the progress report, especially REAMIT's growing presence in social media (website, twitter, etc.). She was curious to see how deliverable 'Publication of the Open Call' document turned out based on suggestions provided at the second RAC meeting (11-12

September 2019) to include a section on ‘benefits for food producer and food transporter companies from participation in REAMIT pilot tests’ and asked for an update on the pilot tests. REAMIT partners thanked JB for her continuous support.

**Action: BED to send updated Open Challenge Call document (which includes a section on benefits for food producer and food transporter companies from participation in REAMIT pilot tests and infographics) to JB at East NL Development Agency.**

**Action: BED to send an update on REAMIT pilot Tests to JB at East NL Development Agency though the details will be included in the next progress report.**

RM 20.01.02 KP asked if other REAMIT partners who have Associated Partners have received feedback from their Associated Partners. Partners confirmed they have not yet sent the second draft REAMIT progress report to the Associated Partners. RR requested partners to provide the progress report to their Associated Partners every six months, as soon as the report is ready, in time for advice and feedback ahead of each RAC meeting.

**Action: REAMIT partners (I&R and UoN) to send to Associated Partners second REAMIT progress report for feedback.**

Associated Partner	Partner responsible for sending progress report and obtaining feedback and suggestions
GIQS	BED
Oost NL (East NL Development Agency)	BED
Radboud University	BED
Terre d’essais	I&R
JEAN ROUTHIAU	UoN
Biosearch NI LTD	UU
Cottagequinn Farms LLP	Dunbia

KP continued the RAC meeting and presented slides summarising REAMIT progress based on the draft second REAMIT progress report.

#### *WP Project management*

RM 20.02.01 Four staff members have been recruited and three more will be recruited in the coming months; all REAMIT partners have appointed their First Level Controllers; first REAMIT report and payment claim were submitted to Joint Secretariat of Interreg NWE Programme in Sept-2019; six bilateral meetings took place among REAMIT project partners; cooperation among partners have been intensified i.e. first RAC meeting (September 2019 hosted by BED, UK) was attended by nine project partners.

#### *WP Long Term*

RM 20.02.02 REAMIT was promoted at ‘NWE making an Impact’ event (4-5 Dec-2019, Tourcoing, France). REAMIT stand at that event was prepared jointly by several partners. BED has developed a first draft of a framework for measuring the impact of REAMIT technologies on reducing food waste. REAMIT partners, under the leadership of NTU, have jointly organised REAMIT first Symposium (January 2020 Nottingham, UK) which sets the premise for future REAMIT Symposia.

### *WP Communication*

RM 20.02.03 NTU has advanced the REAMIT Communication Strategy; updated REAMIT's website; developed REAMIT promotional materials (brochure, two videos, banner, newsletter); and enhanced REAMIT's presence in social media.

KP requested that all partners inform BED and NTU about their activities promoting REAMIT (e.g. participation in exhibitions, conferences, etc.) so that NTU communicates about these activities on REAMIT website and on REAMIT social media platforms.

KP confirmed that every REAMIT partner needs to have a REAMIT roll-up. This is a compulsory publicity requirement of the funder and non-compliance may be penalised by cutting the partner's budget (following on-the-spot audit by the funder or EU Commission's auditors). Partners wanted a template for preparing the roll-up. NTU will send the template but it was highlighted that the main picture should be changed to reflect the activities of each partner.

**Action: Each REAMIT partner to develop a REAMIT roll up by end of June 2020.**

**Action: NTU to send all partners a template for a roll-up.**

RM 20.02.04 KP suggested that each REAMIT partner makes five communication actions each semester to promote REAMIT. These can be e.g. mentioning REAMIT in their organisational newsletter, talking about the project in seminars or discussions they are involved in, uploading REAMIT pictures in social media, making REAMIT related tweets, posting REAMIT related news in LinkedIn or Facebook.

**Action: UOB to remind partners to take five actions each semester to promote REAMIT.**

**Action: Each partner to report on their five communication actions at the next RSC meeting and in the next progress report.**

**Action: NTU to make the hashtag #REAMIT4NWE more actively promoted.**

### *WPT1 Adapting and pilot testing sensor technologies in agri-food supply chains*

RM 20.02.05 KP confirmed that BED has developed the Open Challenge Call document based on input from East NL Development Agency. It now includes a section on 'Benefits for food producer and food transporter companies from participation in REAMIT pilot tests'. This new section currently is available in English only. KP asked partners for help with translating it to French, German and Dutch. Whysor has offered to translate it to German and Dutch, and I&R have offered to translate it to French. All partners are requested to read the new version of the document available at REAMIT website and provide feedback on the new section on 'benefits for food producer and food transporter from participation in REAMIT pilot tests'. The new, updated version of the Open Challenge Call document will be made available on the REAMIT website in four languages.

**Action: Whysor to translate the newly added section on 'Benefits for food producer and food transporter companies from participation in REAMIT pilot tests' in the Open Challenge Call document to German and Dutch, and I&R to translate it to French.**

RM 20.02.06 KP confirmed that based on suggestions from East NL Development Agency, BED has also developed a table summarising benefits for food producer and food transporter companies from participation in REAMIT pilot tests. This table will be presented as infographics and uploaded on REAMIT website. BED will

send a copy to partners and all partners are requested to provide feedback on the infographics. Whysor and I&R have been requested to translate the infographics in the other three languages.

**Action: BED to send the infographics to partners for comments.**

**Action: All partners to send their feedback on infographics to BED and NTU.**

**Action: Whysor to translate the infographics to Dutch and German; and I&R to translate the infographics to French.**

**Action: NTU to upload the infographics in all the four languages to REAMIT website.**

RM 20.02.07 KP discussed a template for pilot tests and requested all REAMIT pilot test leads to use it when presenting pilot tests at REAMIT project meetings in the future.

**Action: All pilot test leads are requested to use pilot test template to report update on the pilot test at the next REAMIT meeting.**

*WPT2 Big Data integration and application to reduce food waste*

RM 20.02.08 KP confirmed that BED was finalising the recruitment process of a Research Fellow responsible for Big Data Hub management and coordination at BED (interviews on 28 January 2020); BED developed specification of equipment to build the Big Data Hub at BED; Whysor has built a platform for REAMIT at reamit.whysor.com; a separate database to identify potential food consumption points in REAMIT corridors is being done by Levstone with self-enrol function; a Smart Phone APP is being developed by Levstone.

KP informed that more detailed updates on progress of WPT1, WPT2 and WPT3 will be presented by leads of these WPs over the next two days. KP closed the RAC meeting.

*Lunch break*

Gerard Corkery (GC) from IT Tralee joined via video conference at 13:30 pm.

### **REAMIT Work Packages meetings**

KP opened REAMIT Work Packages meetings and asked each lead of the WP to chair the meeting.

### **WPT1 Adapting and pilot testing sensor technologies in agri-food supply chains**

RM 20.03.01 KP invited GLB to chair a discussion on WPT1 in the absence of GM. After a brief introduction to WPT1, GLB invited WW to present the first pilot test in UK.

*Pilot test in UK with Dunbia (Lead: Ulster University)*

RM 20.03.02 WD reported an update from the Pilot Tests carried out by Ulster University and Dunbia. WD said that cattle that are stressed produce dark cutter beef, which is usually turned down by consumers, as they are not visually appealing. In consequence, retailers end up with a lot of wasted meat. WD confirmed that UU was considering using another sensor i.e. Bolar sensor. It would measure PH and temperature of the animal and would sit inside the cow's second chamber of stomach. This sensor would indicate that the cow was stressed or hungry. WD said there were ethical problems related to putting sensors inside a cow's stomach. Vets are concerned with fitting sensors inside cows, they are aware the cows can regurgitate the sensors, and the sensors are quite expensive. There will be a meeting with UU and Dunbia to figure out if

these sensors are appropriate. WD said there were several questions raised at the REAMIT Symposium (9 January 2020, Nottingham, UK) related to this new idea. One of them concerned why Dunbia don't mince dark cutter meat, rather than sell it as full cut. This and other relevant points will be discussed by Joan Condell (UU) and Colin Potts (Dunbia) at the upcoming meeting with Dunbia.

GT advised this was a very interesting concept and asked if there was any publication on the sensors proposed by UU. WD advised these were industrial sensors and more information about these sensors would be gathered by UU in the near future.

RR briefed partners about his visit to Dunbia (3 December 2019, Dungannon, UK). During the visit, Colin Potts mentioned that there was minimum or no meat wastage during meat transportation in Dunbia trucks. This is because meat was vacuum packed and reached destinations within a few hours. All Dunbia trucks are temperature controlled and as per Colin, usually there is no problem with Dunbia trucks during meat transportation.

RR confirmed that working with Dunbia and installing sensors in trucks transporting fresh meat was acceptable to REAMIT as the REAMIT project application included farms in its definition of supply chains.

RR also mentioned to the participants that he asked Colin Potts (CP) for the following details based on the decisions during his visit to Dungannon in December 2019.

- In line with the primary theme of REAMIT (on tracking temperature etc. in trucks in which meat is transported), CP will arrange to provide data from data loggers from the trucks used to transport meat. They will be monitored by the REAMIT Big Data Analytics team for any quality issues.
- CP will send some professional photographs on Dunbia for use in REAMIT flyers, website, brochures.
- CP will arrange for a visit by REAMIT team to their packing facility in Coddington.

**Action: CP (Dunbia) to provide data from data loggers from the trucks used to transport meat.**

**Action: CP (Dunbia) to send some professional photographs on Dunbia for use in REAMIT flyers/website/brochures.**

**Action: CP (Dunbia) to arrange for a visit by REAMIT team to their packing facility in Coddington.**

RM 20.03.03 RR said that while UU needed to refocus the pilot test with Dunbia, he has requested Joan Condell, the lead in Ulster University, to search for a new suitable business in the UK to carry out REAMIT pilot test where sensors could be installed in a truck transporting fresh food. RR highlighted that REAMIT's activities were not limited to just five pilot tests; while a minimum of 5 were promised, we should aim to carry out additional tests in order to increase the reach of the project and bring more reduction in food waste. RR confirmed that NTU has offered to carry out another pilot test in England.

**Action: UU to start looking for another pilot test, NTU to provide more details of the new pilot test in England.**

RM 20.03.04 SM asked whether it was possible to install one of Levstone's sensors into Dunbia's trucks to have comparable data and see the differences in how both sensors will capture the data. RR asked WD check it.

**Action: WD to check if Levstone can install their sensor in Dunbia trucks to assess quality of data collected.**

RM 20.03.05 WD described the pilot test with Dunbia in more detail. He said that the objective of the pilot test was to detect the production of the dark cutter beef and possibly, to check mineral deficiency. UU will be buying more Bolar sensors from their supplier; the risk is related mainly to the possibility that the cow regurgitates the sensor. WD said that once the data was collected, UU would retract the sensor from the cow and install it into another cow, rather than buying multiple sensors.

WD said that data on cows' behaviour can be obtained in real time, data will be uploaded directly to the cloud, which they have full access to (Smaxtec sensor provider and cloud server). Data will most likely be received in CSV/ excel format. UU will analyse the data. RR suggested sharing data with other tech partners to review the data. SM suggested that the router could be directed to another IP address. An example could be redirected to Levstone's server, they can communicate to the farmer the real time data and any triggers that need to be communicated.

RR asked what other preventions were available in case sensor data points to the possibility of dark cutter meat. WD said they would most likely just hold off from slaughter. There are others preventative measures but UU will develop further ideas of prevention of dark cutter meat.

**Action: UU to try to make data from sensors available to REAMIT's analytics partners.**

*Pilot test in Germany and the NL (Lead: Whysor)*

RM 20.03.06 KP invited Whysor to present progress on the second and third pilot test in Germany and in the NL.

IH confirmed that Whysor would carry out pilot tests with two companies: a German company Weyers GmbH that is selling vegetables; and a Dutch company Picnic, which in 2019 was the fastest growing company in the Netherlands specialising in delivering fruits and vegetables to private households for a small delivery cost.

IH said that Weyers GmbH stored vegetables in warehouses and transported them from warehouses to supermarkets. Sensors would be fit in trucks. Farmers can provide data such as photos of fresh fruits. Sensors will collect data on smell and appearance of fruit. Sensors (spectroscopy) will also monitor VOC, carbon dioxide and pressure. Data from sensors will be sent to a gateway. This system uses GPS sensors but does not work so well when a vehicle is moving so we will need to find a new sensor that works better in transit. In future, data collected in cloud will be sent to Big Data Hub at BED for analysis. Whysor has produced a cloud server called [whysor.reamit.com](http://whysor.reamit.com) for this purpose.

GT asked how Whysor would measure and evaluate the quality of the food at the end of the process. RR advised there were multiple ways e.g. we could use Raman Spectroscopy and detect the significant variations to detect changes in food quality, or we could monitor variations in traditional measurements such as temperature and humidity as a proxy for food quality indicators. He also sought support from REAMIT partners to work on this to develop it further.

GC (via video conference) asked whether the data would be in easily obtainable format. RR confirmed raw data would be made available from REAMIT sites to Big Data hub at UOB, but we will need someone to carry out data cleansing. RR advised to wait until we see the type of data collected from sensors as then we will know the amount of data cleaning required. RR asked GC when the new Researcher would be appointed at ITT. GC confirmed he/she would start the new role at the end of Feb-2020. RR advised BED would also appoint a Research Fellow (in March 2020) to manage Big Data Hub and data analytics.



RR and SM discussed with IH how customers would upload photos of fruits/vegetables and how this would be analysed. IH confirmed there would be a mobile application to upload such images. RR advised this could be developed further.

IH said confidentiality agreement would need to be signed between Whysor and German and Dutch companies. She asked BED for help with designing a template.

**Action: BED to develop a template of Confidentiality Agreement to be used by partners who need to sign it with the end user company participating in the pilot test.**

RR reminded that all partners should be aware of the cost of buying sensors. Partners should provide sensors to end users rather than expect that end users will purchase the sensors. BED, NTU, UoN and UCD have budget allocated for purchasing sensors. All other partners should set a part of their budget for purchasing and maintenance of sensors.

**Action: All partners to inform BED about the size of their budget available for purchasing sensors.**

IH then provided more details of the Dutch pilot test. Picnic is an online supermarket, which delivered fresh foods to homes. Fresh products were kept cool in separate containers. Temperature sensors monitor temperature of groceries inside each cool box; each truck is fitted with GPS sensors. Data collected from sensors (temperature, GPS location) will be combined with weather data and uploaded into cloud. All data will be transferred to UOB's Big Data hub and to Picnic's data hub. Start date of the Dutch pilot is yet to be determined as there is no final agreement with Picnic yet. RR requested IH to provide starting dates of German and Dutch pilot tests. He proposed to visit the two pilot test sites at a mutually convenient time.

**Action: IH to provide starting dates of German and Dutch pilot tests, and also to propose some dates for RR's visit.**

IH then demonstrated the online cloud server developed by Whysor (Reamit.whysor.com). It shows the measurements of weather data and other various measurements. RR commented that we would be able to obtain the timeseries data from this cloud server. IH advised it was a valuable system to show customers the history of the product before it was delivered to their homes. This would build trust of customers and offered them information to better understand the journey of their food.

KP asked IH what happened when the system sent alerts to end user. IH confirmed Whysor would need to develop this aspect further with Picnic.

GC confirmed the Freshbox project did similar testing to the Dutch pilot with Picnic. GC forwarded a link with information which maybe of relevance for Whysor: <http://fresh-box.info/>.

RR requested GC to check whether a new Irish pilot test would be possible with the Freshbox idea. GC would check and confirm this soon.

**Action: GC to check whether a new Irish pilot test would be possible with the Freshbox idea**

*Pilot test in France (Lead: University of Nantes)*

RM 20.03.07 AA confirmed UoN has been using Raman spectrum and Raman spectroscopy in their tests. They have created a database based on analysis of two meat samples. UoN has two solutions for database. The first solution will have computer built inside the truck, where you can obtain results from the Raman

Spectrum. In the second solution, data will be sent wireless to the cloud. Results of comparison will be sent to a driver. UoN will collaborate with UU and Levstone to develop smartphone application.

Pilot test will start in January 2020 and end in July 2020. UoN expect to receive new traditional sensors in mid Jan-2020 from IQRF to supplement their Raman sensors. They will have chemical information of the samples and microbiological information; and will have a wider spectrum of data with these new sensors. Contactless probe will be used to obtain the data of the food. The objective of the pilot is to test meat quality using Raman-Spec. RR suggested we should get Whysor involved in collecting the sensor data into cloud.

**Action: UoN to collaborate with Whysor to develop the cloud system for Pilot Test carried out by UoN.**

AA said that the challenge is using portable device (spectrometer) to detect data while moving – showing Raman spectrum of chicken also using Raman spec to analyse the packaging of the chicken. This can detect the intensity. UoN will use ocean optics spectrometer. Maximum intensity of the laser will provide the maximum details of the packaging. In order to avoid overlap in data, they have to develop algorithms.

RR suggested that partners ask for support in pilot tests, should they need help. There will be a researcher at BED dedicated specifically to data analytics in REAMIT and since we have more pilot tests running, this will give confidence to end users.

**Action: Whysor, UU and UoN to provide photos representing their pilot tests. Photos should be sent to NTU and BED and will be used in REAMIT promotional materials developed by NTU.**

*Pilot test in Ireland (Lead: UCD)*

RM 20.03.08 SW confirmed UCD was responsible for Cyberbar demonstrations. SW said his lab was working on imprinting QR codes onto chicken fillets. This process eliminates the necessity of relying on the information on the packaging. Cyberbar can be read on iPhone, creates traceability of the chicken meat, without needing the original packaging information. Things like the expiry date would be imprinted on the chicken meat, without having to refer to the packaging. UCD experimented with organic broccoli (which was niche market) to remove the plastic, hence decreasing waste. UCD will start demo towards end of the year. UCD are also working with a large food processor in Ireland on demonstration of the pilot. RR reminded that all pilot tests, including the Irish one, will have traditional sensors (temperature, humidity, vibrations, lighting, etc.) and GPS, in addition to any specialist system (e.g., Cyberbar for the Irish pilot and Raman for the French pilot). SW agreed and promised that Cyberbar will be complimented with other sensors including temperature sensor.

PY, new staff member at UU, asked whether there would be a visible barcode imprinted on the chicken meat. Different forms of symbology can be embedded in the food, not necessarily QR code. DB suggested if we promote the idea of traceability, people would be more likely to buy food. Otherwise, some will think it is unethical to imprint chicken meat with a traceability system. Depending on the market, some people will be happy with the environmental impact. UCD also discussed imprinting chicken meat without damaging the meat.

Break for coffee.

*The Second Pilot test in France (Lead: I&R)*

RM 20.03.09 DB explained that due to last minute absence notice of GM (due to important family matters) he was not able to provide details on the second pilot test in France where I&R were a lead.

Instead, DB offered to show a video which was recently developed by I&R. The video focused on food waste reduction from farm to supermarket where GT and DB talked about the theme of REAMIT. It is in French and it is available on YouTube:

[https://www.youtube.com/watch?v=p0Y2KB\\_iosI](https://www.youtube.com/watch?v=p0Y2KB_iosI). RR welcomed this video and asked NTU to upload a link onto the REAMIT website.

**Action: NTU to upload the link to the YouTube video developed by I&R onto the REAMIT website.**

#### *Pilot test using 3D Fluorescence Spectrometers*

RM 20.03.10 RR highlighted the need to run another pilot test using 3D Fluorescence Spectrometers. This was included in the application form as FreshDetect, who were a partner in the successful application but later pulled out as they became insolvent, promised a pilot test using this new technology. Since UU has kindly offered to do these tests in place of Freshdetect, the funds of FreshDetect have been transferred to UU. Hence, he requested UU to ensure that this pilot test will be completed on time. RR also mentioned that BED has an expert on the technology. The expert, Tahmina Ajmal (TA), is already in the REAMIT team.

**Action: UU to update partners about progress in 3D fluorescence pilot test at 4<sup>th</sup> RSC meeting (July 2020). WD agrees to work with TA at BED to develop this.**

#### **WPT2: Big data integration and application to reduce food wastage (Chair BED – RR)**

RM 20.04.01 RR explained that activities in WP T2 have not yet been started in a big way as they are depended on running of pilot tests. Nevertheless, preliminary activities to ensure big data integration have already been started. For example, BED has scheduled interviews to select a Research Fellow who will manage procurement and maintenance of the Big Data Hub. He also asked Levstone on the progress of the second database that has food consumption points (e.g., supermarkets, convenience stores, food charities and other similar actors) on REAMIT corridors. He also wanted this database to have self-enrolment facility so that interested food consumption actors can enrol themselves. This database will be used to decide optimal rerouting of trucks to nearby consumption points in case of potential loss of quality. The optimal rerouting will be done using sophisticated vehicle routing algorithms built into the database.

RR said it was important to enable food stores and food banks to enrol in the database. Levstone has already taken steps to collect the data of who can use REAMIT food and identified possible demand points.

SM confirmed that customers with tight security (data privacy) on food rerouted from REAMIT truck would be treated separately. Levstone has facility to register their interests in getting the food from rerouted truck. End user will facilitate rerouting of the food. Supply point is the one with facility to receive the food.

RM 20.04.02 RR asked Levstone to update progress on the second self-enrolling database and their efforts on data security in REAMIT.

UR asked what data security was. SM said that data security and governance was different in every country. RR requested SM to help create a general data governance system for REAMIT.

**Action: Levstone to update progress on the second self-enrolling database and their efforts on data security in REAMIT. Also, to help create a general data governance system for REAMIT.**

SM confirmed there is an overlap of WP1 and WP2. Truck driver can take a photo at the beginning and at the end of transportation to show the evidence. Collection of millions of data will be compared with the drivers' photo of the goods – this will add value.

RR confirmed BED was recruiting Research Fellow to manage Big Data and perform data analytics. BED held interviews for Research Fellow post on 28 January 2020. Research Fellow recruited at BED will be involved in designing confidentiality agreement for data security; and will do data cleansing.

There were further discussions about collecting and storing sensor data. It was suggested that Levstone (SM) can check with Whysor (Marcel and Luuk) on collection of data. Whysor has already produced a cloud server (Reamit.whysor.com). RR further confirmed that Big Data hub will get the redirected data.

RM 20.04.03 RR requested SM for an update on the 3<sup>rd</sup> activity under WPT2 – smart phone app being developed by SM (Levstone). SM would provide a detailed description soon.

**Action: Levstone to update progress on preparation of the Smartphone App.**

RR said that WP2 started only from January 2020 and in the next 6 months we will have more activities to report.

RM 20.04.04 SM showed the members an interesting new sensor called Pebble – Blue maestro. It costs £40 with 5-year battery to collect data (on temperature, humidity, du point and pressure). It is standalone sensor. It can be put in a truck. This device can be linked to a smartphone inside a truck (e.g., the smartphone used by the Driver or a dedicated smartphone fixed in the truck by the REAMIT team). The phone not only would provide GPS data but will also collect the sensor data and to the cloud. This will enable faster downloading of the data, and rerouting is possible. This is very low-cost solution. Another significant advantage of this Pebble sensors is that the interface is public (unlike several commercial sensors that require the data be routed to a dedicated server of the sensor manufacturer), enabling easy coding for linking to the Smartphone application. RR requested SM to check with the leads of all pilot tests and with Whysor (who will install sensors and connect them to cloud for all pilot tests) about the appropriateness of using Pebble.

**Action: SM to provide detailed technical description of Pebble and discuss about using it in pilot tests with pilot test leads and Whysor.**

UR asked who would decide on rerouting. RR and SM said only the owner of the truck would decide the rerouting.

Levstone made an additional presentation on the next day to follow this up (see RM 20.08.10).

### **WPT3 Business development of REAMIT (Lead – UU)**

RM 20.05.01 KP invited UU to chair this WP meeting. SW (UCD) confirmed that UCD has conducted research into the state of the art in terms of life cycle assessment and food waste. The REAMIT Sensor Review Report, when it is ready, would be analysed to identify the methods of measurement of relevant parameters for the LCA study. It was concluded that WPT3 activities will start later in the year.

RM 20.05.02 There was a discussion on the reliability of data from sensors. Several streams of data are of importance in REAMIT – including data on food consumption points, self-enrolling food consumption data, data on temperature, humidity, etc. – may be affected by data reliability. For example, if battery life of a

sensor is much lower than promised life from the manufacturer, this will affect reliability. RR requested technological partners to provide a robust scheme for testing the sensors.

**Action: All technology partners to test the reliability of their systems before installation in REAMIT.**

#### **Day 2 – 16 January 2020**

RR welcomed the partners for the second day of the meeting.

#### **REAMIT Video made by SB**

RM 20.06 RR asked partners if they agreed to be recorded by SB who would make a short REAMIT video with input from all partners. Partners were asked for a 45 seconds input focusing on:

1. "At the University of.....we work on ...
2. This is consistent with our role in REAMIT...
3. We are excited for working in the project because...

All partners agreed to be filmed by SB.

**Action: NTU to develop REAMIT video based on partners' input.**

RR invited UR to lead WP Communication meeting.

#### **WP Communication meeting**

RM 20.07.01 UR summarised the work done under WP Communication.

SB played REAMIT video which is being produced by an external consultant. She asked partners for comments and suggestions for improvements. Main comment from the partners concerned the need to improve presentation of partners' geographical locations in the video.

**Action: SB to improve the video based on the comments by REAMIT partners.**

SB confirmed that tweeting about REAMIT should be systematic, as Twitter is an important communication channel in business nowadays. Tweeting is about building your e-reputation. Partners exchanged about tweeting. They asked whether when they tweet, they push information as individuals or as organisations. They concluded that they should tweet only professional things/messages to be regarded as organisational tweets.

**Action: All partners to make at least five communication actions about REAMIT each semester, among this at least one tweet.**

**Action: All partners to include REAMIT logo in their organisation's website, email signature, etc.**

UR briefed partners about the need to improve REAMIT Communication Strategy document based on input from Madara Rancane, REAMIT officer at Joint Secretariat of Interreg NEW Programme. UR asked partners for input regarding communication objectives and target audiences. SM suggested that REAMIT would be able to identify communication target audiences as soon as we have something to tell them e.g. that REAMIT pilot works. That is why we need a working pilot.

UR and SB briefed partners about REAMIT first Symposium (9 January 2020, Nottingham, UK).

RM 20.07.02 Ideas for the second REAMIT Symposium were discussed such as e.g. providing speed-dating function or arranging designated timeslots for bilateral talks. They should help increase attendance at the symposium i.e. avoid a situation where people sign up for the Symposium, but do not turn up.

**Action: All partners to send their ideas for the second REAMIT symposium to the organisers (I&R and Valorial), NTU and BED.**

RR closed the WP meetings, noting that WP LT has been discussed immediately after the RAC meeting (see minute RM 20.02.02) and WP M was discussed in RM 20.02.01 with more discussions as part of the RSC meeting on risk log (RM 20.08.07).

### **WP Project Management meeting**

RM 20.08.01 KP confirmed that REAMIT Project Management Handbook has been advanced to include sections on: Responsibilities of the lead partner and project partners; Legal agreements; REAMIT Committees; Monitoring of the REAMIT project; Reporting and reimbursement process, REAMIT project financial management and REAMIT project evaluation. Moreover, it includes two annexes: Minutes of REAMIT Steering Committee and Risk Log. Project Management Handbook contains also lessons learnt and feedback from Madara Rancane (REAMIT officer at Interreg NWE Programme Joint Secretariat) from each project reporting exercise, and answers to questions raised by partners during REAMIT project implementation. Partners are encouraged to review the Handbook, provide their feedback and ideas for improvements.

RM 20.08.02 KP confirmed that BED has received feedback from Madara Rancane regarding REAMIT Risk Log. REAMIT Risk Log needs to be developed further and submit to Interreg NWE Join Secretariat with the second project report. KP run a dedicated session on REAMIT risks during RSC meeting.

RM 20.08.03 KP confirmed that minutes and list of actions from the first RSC meeting were circulated to partners in October 2019 and were included in the seminar pack. RR run a session dedicated to the minutes and actions during RSC meeting.

### **WP Long Term meeting**

#### **REAMIT Measurement Framework**

RM 20.09 RR presented the draft REAMIT measurement framework. He highlighted that computing avoided carbon emissions requires data from previous studies. He drew up on the FUSIONS project report by WRAP in which it was reported that emissions of 3090 kg of CO<sub>2</sub> can be prevented per tonne of food waste if the food is redistributed to people from manufacture / retail. This coefficient could be used in REAMIT once we know the quantity being redistributed.

However, he also highlighted more recent studies, which seemed to suggest the avoided CO<sub>2</sub> emissions will be different for different kinds of food with plant-based food resulting in lower values while meat based food producing higher levels of emissions. Accordingly, he presented data from recent studies that showed this difference using quantitative data. Using these quantitative data, he then arrived at revised values of avoided CO<sub>2</sub> emissions. This has highlighted that if a tone of beef is prevented from becoming waste and redistributed, then the avoided carbon emissions could be as high as 22002 kg of CO<sub>2</sub>. The values are much lower for plant-based food. For example, for tomato grown in the Netherlands, the value is just 1517 kg of CO<sub>2</sub> per ton of tomato redistributed.

RR further highlighted more research need to be done in this area, and requested partners to send their feedback.

**Action: All partners to send their feedback on the REAMIT Measurement Framework.**

KP closed the meetings for the day.



## REAMIT Steering Committee (RSC) meeting

RR opened RSC.

RM 20.10.01 RR asked if partners had comments to the draft minutes from RSC meeting (Sept-2019, Luton, UK). Partners had no comments and draft minutes of that meeting have been accepted as accurate reflection of the first RSC meeting.

RM 20.10.02 KP confirmed that REAMIT first report was submitted to Joint Secretariat in Sep-2019. KP presented feedback from Madara Rancane (REAMIT officer at Interreg NWE Programme Secretariat) on first REAMIT project activity and finance report (January – June 2019) and payment claim. The following comments were sent to BED in Dec-2019 by REAMIT officer at Interreg NWE programme:

- Communication in eMS must be in English.
- All partners need to provide sufficient level of information when reporting every cost item: name of the person; type of cost (e.g. travel), kind of ticket purchased (plane, train, etc.), activity the cost is related to, location of the activity, date of the activity.
- Staff cost should be distributed across WPs in every reporting period.
- Staff time sheet template should be used for staff working part time on REAMIT.
- All partners need to report in eMS.
- Target groups that each partner has reached should be reported in eEMS, e.g. Agri-businesses, transport companies, food companies, local authorities, etc. For more information about REAMIT target groups please consult REAMIT Application Form.
- Every partner needs to identify their target groups and communicate directly to their target groups at least five times during REAMIT project lifetime. **Action: Every partner to identify their target groups and communicate directly to their target groups at least five times during REAMIT project lifetime.**

**Action: BED to send timesheet template to all partners.**

**Action: All partners to observe the requirements above (RM 20.08.03) while submitting their progress reports and financial reports.**

RM 20.10.03 KP briefed partners about timeline for second reporting round. KP presented key points and calendar for second REAMIT project activity and finance report (July – December 2019). BED received all partner activity reports in Dec-2019. Regarding partners finance reports, partners need to finish all work on their reports, including first level control audit, by 16 February 2020. This means all partners must submit their partner's activity and finance report as well as payment claim and spending forecast for the next 6 months, early enough for their auditor to complete audit by 16 Feb-2020. To do this, it is advisable that partners agree with their auditor in advance the timing of the audit so that the audit is completed by 16 February 2020.

**Action: All partners to observe the deadlines in RM 20.12.01 for their progress reporting.**

RM 20.10.04 SW asked whether partners can put the claim altogether in June 2020. KP advised that most probably no as we needed to report volume of spending now, by end of March 2020. If REAMIT underspends, there is a chance of having a cut of the corresponding REAMIT partners' budget.

RM 20.10.05 SW mentioned that they were unable to host the next RSC meeting in UCD as originally planned as per the minute RM 19.06.04. He requested that this meeting could be swapped with another meeting. IH responded and offered to host the next RSC meeting in the Netherlands. Accordingly, it was decided that the 4<sup>th</sup> RSC meeting will be organised by Whysor in the NL on 8-9 July 2020 and 5<sup>th</sup> RSC meeting will be organised by UCD in Dublin on 20 – 21 January 2021.

### Deviations from Work Plan

RM 20.10.06 RR confirmed the partnership is making good progress in project implementation and there are no major delays yet on the project level. RR asked partners to report any deviations on the partner level.

UoN confirmed the sensor equipment they have purchased was delivered only now, in January 2020. However, they expect to get data from pilot tests by May/June 2020. RR confirmed that this does not create a delay for REAMIT.

RR requested more details from three pilot tests where the leads are: UCD, I&R and UU (regarding 3D fluorescence). This information should be sent to BED before RSC meeting in July 2020.

**Action: By mid-April UCD, I&R and UU are requested to send to BED information about progress in the pilot tests they lead.**

RR suggested that with regards to the Pilot Test in France under the leadership of I&R, REAMIT partnership is banking on I&R's (and Valorial's) business links and hope for more than one pilot test in France. They could use the pilot tests pioneered by Whysor as an example.

Several REAMIT partners advised that some companies are very concerned about their company's name being mentioned in REAMIT materials. They claim this is deteriorating for their reputation and gives an advantage to their competitor companies who tend to believe they have problems. RR mentioned that associating with REAMIT could also be viewed positively, as these companies are willing to encourage innovation and as green champions.

SM confirmed we needed proof of concept to attract more companies to participate in pilot tests. In order to have proof of concept we need to start at least one pilot test. It seems to be a catch 22 situation and REAMIT's inescapable dilemma. SM confirmed that REAMIT couldn't seem like trying to create a new problem for businesses to solve. Rather, REAMIT tries to help solve problems that companies have. Hopefully, in the next 6 months we will make a progress and will be able to leverage more end users to participate in pilot tests.

### **REAMIT risk log**

RM 20.10.07 KP reminded partners about REAMIT risks reported in REAMIT Risk Log. Risk Log is a compulsory document required by the funder and it needs to be reviewed by the partnership systematically. Currently the Risk Log contains eight risks: three risks have been identified in REAMIT Application Form and five risks have been added following second RSC meeting (September 2020, Luton). KP invited all partners to brainstorm if they considered other risks for REAMIT.

SM pointed out that short life of a battery inside a sensor fit in a truck is a risk. Failure of a sensor battery due to cool conditions inside the truck can be a risk too.

SM suggested that to mitigate this risk we need to consider batteries with longer life, such as e.g. 5000 hours, install more than one sensor in a truck and clarify all uncertainties with sensor manufacturers in the moment we purchase sensors. If battery life is not what the manufacturer says, our efforts to collect data may fail and we will have no data if a sensor has failed. Consequently, we will have no information about what is happening inside the truck. Moreover, conditions inside the truck maybe be impossible for a sensor to handle. For example, in a cool truck, a battery may be affected as it may not handle cool temperature well.

KP asked how to mitigate this risk. SM confirmed that to mitigate this risk, we need to install multiple sensors in a truck (they are cheap, and we can afford them) to obtain data from multiple sensors. This will allow us to do combined reading of sensors' data.

SM confirmed that another way to mitigate this risk is to ensure a battery sends a warning signal when it goes down. When purchasing sensors, we need to make sure that the manufacturer of the sensor provides a function informing us when sensor battery is going down.

KP asked about ownership of this risk. RR confirmed that whoever is the lead of a Pilot Test is the owner of this risk since they are the first one to get notified.



KP asked partners if they foresee other risks but no other risks have been identified.

KP asked partners to reflect on four risks which were added to the REAMIT Risk Log following the second RSC (September 2019, Luton, UK).

*Additional Risk No 1: effectiveness of sensors in providing genuine new information*

Partners commented that if a sensor does not offer new genuine information, it will not be used in REAMIT pilot tests. Only these sensors will be used in REAMIT Pilot Tests, which provide genuine, new information. Moreover, reading from a sensor must be correct and for this reason correct calibration of the sensor must be done at the start. Otherwise, the risk is that sensors don't provide correct data, thus the analysis of this data will be wrong.

*Additional risk No 2: Maintaining confidentiality of the sensor data on food quality from end-users*

To mitigate this risk, all pilot test leads need to write an agreement with the end user company. The agreement must cover data governance issues. A Research Fellow employed by BED (expected to join the REAMIT team in March 2020) will also have a function of data controller who checks quality of data collected from sensors and ensures that storing and analysis of data complies with EU and GDPR requirements.

*Additional risk No 3: Risk of not using the correct sensor for a given application*

Though it is difficult to expect complete knowledge of all available sensors to be able to choose the best one for a given application, RR requested all partners to document their knowledge on sensors in the Sensor Review paper. He highlighted that the practical experience of REAMIT partners would be a great contribution to knowledge. He requested partners to send their responses to the table of best sensors for a given combination of chillness of food (frozen, chilled, ambient, etc.), kind of perishable product (fruits such as strawberry, meat, fish, etc.) and specific part of the supply chain (truck, warehouse, etc.). This can help prepare a successful research article for publication in reputed journals.

**Action: All partners to contribute to the Sensors Review continuously, specifically for the table of best sensors for a given combination of chillness of food, kind of perishable product and specific part of the supply chain.**

*Additional risk No 4: Though we strive to reroute food before it becomes bad, there is risk involved as the food might become waste during rerouting.*

Partners confirmed that this is the last stage of food transportation process, and that it is out of their control if a truck driver takes too much time to take a decision or not. Therefore, partners agreed that this risk should be deleted from REAMIT Risk Log, though REAMIT will try best to link owners and food demand points as early as possible

*Additional risk No 5: Receiving store does not accept the food*

Partners suggested that a closer store might not accept the food in the lorry. For example, Auchan will not accept and sell food from Intermarche, if such food is on the way and in risk of becoming waste. SM said that the REAMIT APP needs to have a function, which links food owners with food consumers. Also, ultimately end users of REAMIT will use REAMIT to improve food quality rather than to reroute waste. GT said that STEF are asking food certificate at two moments (1) before food is on the move and (2) when food arrives at a destination. In this way they control freshness of food during the journey. RR highlighted that, similar to Additional Risk 4, this risk is also beyond the control of the REAMIT consortium. REAMIT will try to link owners and food demand points but the negotiations between the two is not under the project's control.

**Action: Bed to update REAMIT Risk Log.**

**Conference call with GM**

RM 20.10.08 GM has joined the discussion through the conference call. He confirmed that the FLC process at I&R took as long as one month. In order to submit I&R report to LP on 16 Feb-2020, I&R would need to initiate FLC process of I&R now i.e. in mid-January.

## **REAMIT elevator Pitch**

RM 20.10.09 KP presented the additions to the Open Challenge Call document based on the comments of the first RAC meeting. The additions included 'Benefits for food producer and food transporter companies from participation in REAMIT pilot tests'. KP explained that the text on benefits would be accompanied by infographics i.e. a powerful tool to communicate with end users of REAMIT technologies. KP invited partners to comment about the proposed benefits. Partners suggested that a short video could be developed based on the proposed text on the benefits.

**Action: NTU to consider preparing a short video highlighting the benefits to food producer and food transporter companies.**

SM suggested that the list of benefits could be presented also as an elevator pitch, and that this can be developed over the period of time. SM said that in the REAMIT website we need to have all these elements to effectively communicate about benefits from participation in REAMIT pilot Tests: newsletter, posters, videos and infographics.

KP suggested that the infographics would present four categories of benefits: financial (SM said that this must not be the focus of REAMIT), technological, image building, and access to wide network.

SM suggested that cost of fitting sensors might not attract businesses to accept REAMIT technologies. However, it can help indirectly.

KP invited partners to brainstorm about ideas for REAMIT elevator pitch. The following ideas emerged from the brainstorming session:

UR: REAMIT will create a new norm for using sensors to reduce food waste.

GT: REAMIT creates a point of care analysis. We diagnose quality of food before it reaches the consumer.

AA: We certify your food quality, point of freshness, food health.

RR: We will reduce your insurance costs. We will complete full certificate of food quality.

DB: YUKA supply chain. CO2 footprint of supply chain.

DB explained that YUKA is an independent mobile phone application that allows people to scan the bar code on a product and get a "score" on the healthiness of this product with recommendations on "healthier" products to buy instead. YUKA website <https://yuka.io/> is currently available only in French. The idea was that REAMIT could be used to inspire a YUKA-like application that would be able to scan a bar code and indicate how "CO2" friendly was the logistic path it took to get to the consumer. Products that benefit from REAMIT's optimized logistics thanks to early warning on possible degradation would obviously receive a higher score on the application. This is an idea to inspire thought among REAMIT partners and the ecosystem interested in the project.

## **Presentation by Levstone**

RM 20.10.10 RR has invited SM to make a presentation about Levstone's activities in REAMIT. This is a follow-up of WPT2 discussion in RM 20.04.02.

SM said that GPS is about recording history i.e. telling you where you have been. However, you also need to know where somebody is going. REAMIT technology installed in a truck will inform you where the truck is going. Also, if a truck / sensor inside a truck stops communicating, you will get an alert about it.

Partners asked SM whether we could do tracking without a mobile phone.

SM said that normally you would need to have a permanent power supply in a truck to recharge your phone if its battery is low. He suggested that we could create a solution that uses a battery, rather than power from the truck. This solution

would have a local buffer – if there is no communication with the sensors, it can store data. SM confirmed we needed a concept for saving data. The cost would be EUR 150. SM confirmed that Levstone tested such solution recently: they put it in a box, tested it and run power to 0, and lost all the configuration. Levstone realised that to remotely reconfigure the sensor, was not a secure solution. Top security solution is when you set it up again locally. Solar power can supply energy too. The device needs to have low voltage detection so that it shuts in time to save data. Then it starts up again once it has been recharged. SM confirmed that currently he experimented with GSM mobile data network. Another idea is to try the LORA network which is cheaper and less energy consuming. SM confirmed that after 40 hours of testing they put a device into sleeping mode as it could be switched off manually. Then they recharged it manually. Regardless of sampling frequency of the sensor (every minute or every hour), still the life of its battery is 40 hours.

SM said that for REAMIT project it was a big advantage to have a phone as you could take pictures as well.

DB suggested that it was important that REAMIT had data management plan.

RR confirmed developing data management plan would be a task for the Research Fellow at BED employed to manage Big Data Hub.

**Action: BED to coordinate development of data management plan for REAMIT.**

Lunch break

### **Updates on Sensor Review**

RM 20.11 While the paper on Sensor Review has been discussed at length during the session on REAMIT risk log (Additional Risk 3 in RM 20.10.07), RR invited further discussions from partners. He presented a table listing given combinations of chillness of food, kind of perishable product and specific part of the supply chain and requested partners to use their practical experience to complete the table.

RR further informed partners that an abstract of sensor review has been submitted for presentation at the 2020 Conference of the European Operations Management Association in Warwick, UK, in June 2020.

RR requested all partners to complete their activities for the video. The meeting then closed with thanks from Chair.

## Matters Arising and Actions

Date	Minute/ Item	Action	Responsibility	Update
		<i>Action identified, including referral to other committees</i>	<i>Partner(s) with lead responsibility</i>	<i>Confirmation of completion or reasons for non-completion</i>
15/01	RM 20.01.01	BED to send updated Open Challenge Call document (which includes a section on benefits for food producer and food transporter companies from participation in REAMIT pilot tests and infographics) to JB at East NL Development Agency.	BED	Completed
15/01	RM 20.01.01	BED to send an update on REAMIT pilot Tests to JB at East NL Development Agency though the details will be included in the next progress report.	BED	Completed
15/01	RM 20.02.03	REAMIT partners (I&R and UoN) to send to Associated Partners second REAMIT progress report for feedback.	I&R UoN	Completed
15/01	RM 20.02.03	Each REAMIT partner to develop a REAMIT roll up by end of June 2020.	Each partner	Ongoing
15/01	RM 20.02.03	NTU to send all partners a template for a roll-up.	NTU	Completed
15/01	RM 20.02.04	BED to remind partners to take five actions each semester to promote REAMIT.	BED	Completed
15/01	RM 20.02.04	Each partner to report on their five communication actions at the next RSC meeting and in the next progress report.	Each partner	Ongoing

15/01	RM 20.02.04	<b>NTU to make the hashtag #REAMIT4NWE more actively promoted.</b>	NTU	Ongoing
15/01	RM 20.02.05	<b>Whysor to translate the text added to Open Challenge Call document to German and Dutch; I&amp;R to translate it to French.</b>	Whysor  I&R	Completed
15/01	RM 20.02.06	<b>BED to send the infographics to partners for comments.</b>	BED	completed
15/01	RM 20.02.06	<b>All partners to send their feedback on infographics to BED and NTU.</b>	All partners	Completed
15/01	RM 20.02.06	<b>NTU to develop infographics on benefits for food producer and food transporter companies from participation in REAMIT pilot tests.</b>	NTU	Completed
15/01	RM 20.02.06	<b>Whysor to translate the infographics to Dutch and German; and I&amp;R to translate the infographics to French.</b>	Whysor I&R	Completed
15/01	RM 20.02.06	<b>NTU to upload the infographics in all the four languages to REAMIT website.</b>	NTU	Completed
15/01	RM 20.02.07	<b>All pilot test leads to use pilot test template to report update on the pilot test at the next REAMIT meeting.</b>	Pilot test leads	Completed
15/01	RM 20.03.02	<b>Dunbia to provide data from data loggers from the trucks used to transport meat.</b>	Dunbia	NA
15/01	RM 20.03.02	<b>Dunbia to send some professional photographs on Dunbia for use in REAMIT flyers/website/brochures.</b>	Dunbia	NA

15/01	RM 20.03.02	<b>Dunbia to arrange for a visit by REAMIT team to their packing facility in Coddington.</b>	Dunbia	NA
15/01	RM 20.03.03	<b>UU to start looking for another pilot test, NTU to provide more details of the new pilot test in England.</b>	UU	Completed
15/01	RM 20.03.04	<b>UU to check if Levstone can install their sensor in Dunbia trucks to assess quality of data collected.</b>	UU	NA
15/01	RM 20.03.05	<b>UU to try to make data from sensors available to REAMIT's analytics partners.</b>	UU	Ongoing
15/01	RM 20.03.06	<b>BED to develop a template of Confidentiality Agreement ready to be used by partners who need to sign it with the end user company participating in the pilot test.</b>	BED	In progress
15/01	RM 20.03.06	<b>All partners to inform BED about the size of their budget available for purchasing sensors.</b>	BED	In progress
15/01	RM 20.03.06	<b>Whysor to provide starting dates of German and Dutch pilot tests, and also to propose some dates for RR's visit.</b>	Whysor	Completed
15/01	RM 20.03.06	<b>ITT to check whether a new Irish pilot test would be possible with the Freshbox idea.</b>	ITT	Ongoing
15/01	RM 20.03.07	<b>UoN to collaborate with Whysor to develop the cloud system for Pilot Test carried out by UoN.</b>	UoN and Whysor	Ongoing
15/01	RM 20.03.07	<b>Whysor, UU and UoN to provide photos representing their pilot tests. Photos should be sent to NTU and BED and will be used in REAMIT promotional materials developed by NTU.</b>	Whysor UU UoN	Completed

15/01	RM 20.03.08	<b>NTU to upload the video developed by I&amp;R on the REAMIT website.</b>	NTU	Completed
15/01	RM 20.03.10	<b>UU to update partners about progress in 3D fluorescence pilot test at 4<sup>th</sup> RSC meeting (July 2020). WD agrees to work with TA at BED to develop this.</b>	UU	Ongoing
15/01	RM 20.04.02	<b>Levstone to update progress on the second self-enrolling database and their efforts on data security in REAMIT. Also to help create a general data governance system for REAMIT.</b>	Levstone	Completed
15/01	RM 20.04.03	<b>Levstone to update progress on preparation of the Smartphone App.</b>	Levstone	Completed
15/01	RM 20.04.04	<b>Levstone to provide detailed technical description of Pebble and discuss about using it in pilot tests with pilot test leads and Whysor.</b>	Levstone	Ongoing
15/01	RM 20.05.02	<b>All technology partners to test the reliability of their systems before installation in REAMIT.</b>	BED	Ongoing
16/01	RM 20.06	<b>NTU to develop REAMIT video based on partners' input.</b>	NTU	Completed
16/01	RM 20.07.01	<b>NTU to improve the REAMIT video based on the comments by REAMIT partners.</b>	NTU	Completed
16/01	RM 20.07.01	<b>All partners to make at least five communication actions about REAMIT each semester, among this at least one tweet.</b>	All partners	Ongoing
16/01	RM 20.07.01	<b>All partners to include REAMIT logo in their organisation's website, email signature, etc.</b>	All partners	Completed

16/01	RM 20.07.02	<b>All partners to send their ideas for the second REAMIT symposium to the organisers (I&amp;R and Valorial), NTU and BED.</b>	All partners	Completed
16/01	RM 20.09	<b>All partners to send their feedback on the REAMIT Measurement Framework.</b>		ongoing
16/01	RM 20.10.02	<b>BED to send timesheet template to all partners.</b>	BED	Completed
16/01	RM 20.10.02	<b>Every partner to identify their target groups and communicate directly to their target groups at least five times during REAMIT project lifetime</b>	Each partner	Ongoing
16/01	RM 20.10.02	<b>All partners to observe the reporting requirements listed in RSC meeting (RM 20.11.02) while submitting their progress reports and financial reports.</b>	All partners	Ongoing
16/01	RM 20.10.06	<b>By mid-April UCD, I&amp;R and UU are requested to send to BED information about progress in the pilot tests they lead.</b>	UCD I&R UU	Completed
16/01	RM 20.10.03	<b>All partners to observe the deadlines in RM 20.12.01 for their progress reporting.</b>	All partners	Completed
16/01	RM 20.10.07	<b>All partners to contribute to the Sensors Review continuously, specifically for the table of best sensors for a given combination of chillness of food, kind of perishable product and specific part of the supply chain.</b>	All partners	Ongoing
16/01	RM 20.10.07	<b>BED to update REAMIT Risk Log.</b>	BED	Completed
16/01	RM 20.10.09	<b>NTU to consider preparing a short video highlighting the benefits to food producer and food transporter companies.</b>	NTU	Completed



16/01	RM 20.10.10	<b>BED to coordinate development of data management plan for REAMIT.</b>	BED	In progress
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## Minutes from RAC/WP/RSC meetings, 8-9/07/2020 (Zoom online meeting room)

Present:

Name	Institution	Name	Institution
Ram Ramanathan (RR)	BED	Ali Assaf (AA)	UoN
Katarzyna Pelc (KP)	BED	Pat Doody (PD)	ITT
Lohithaksha Maniraj Maiyar (LM)	BED	Gerard Corkery (GC)	ITT
Tahmina Ajmal (TA)	BED	Joan Condell (JC)	UU
Yanqing Duan (YD)	BED	William Duffy (WD)	UU
Shantanu Banerjee (ShB)	BED	Pratheepan Yogarajah (PY)	UU
Gael Maugis (GM)	I&R	Bryan Gardiner (BG)	UU
Usha Ramanathan (UR)	NTU	Daniel Kelly (DK)	UU
Sasha Bennett (SB)	NTU	Fabien Tencé (FT)	SenX
Simon McGraw (SM)	Levstone	Imke Hermens (IH)	Whysor
Blandine Fortin (BF)	Valorial	Luuk Rijnbende (LR)	Whysor
Saptarishi Chakravarty (SC)	UCD	Marcel Steegh (MS)	Whysor
Fionnuala Murphy (FM)	UCD	Mark Logan (ML)	WD Meats
Shane Ward (SW)	UCD	Joline Brouwer (JB)	Oost NL
Frank Gorte (FG)	Picnic		

Apologies:

Gerald Thouand, UoN  
 Fionnuala Murphy, UCD (Day 2)  
 Shane Ward, UCD

Oliver Breuer, QIQS  
 Annemarie Vilsteren, Oost NL

## **Welcome to REAMIT meetings (Chair: BED)**

20.12.01 RR opened the meeting and welcomed all attendees (partners, sub-partners and associated partners) to a 2-day round of REAMIT project online meetings hosted by Whysor. RR thanked everyone for their efforts in the implementation of the REAMIT project so far.

RR said there were 5 REAMIT pilot tests running (or in the pipeline), there were more funds to be allocated to new pilot tests and all partners were requested to help bring in more pilot tests.

RR reminded that the agenda and minutes from previous RSC meeting were distributed to attendees via email.

20.12.02 RR welcomed new staff to the REAMIT project team:

- Shantanu Banerjee, Visiting Lecturer/Consultant, BED
- Lohithaksha M Maiyar, Research Fellow, BED
- Saptarishi Chakravarthy, Master Student, UCD

20.12.03 SB asked everyone to pose for a group photograph. All attendees turned on their cameras and SB took photos of the REAMIT team meeting online.

RR handed over to KP.

20.12.04 KP welcomed the attendees and summarised the agenda for Day1. She confirmed that an updated agenda would be sent for the second day. It would be updated based on progress of Day 1 meetings. KP asked if there were any questions or issues before the meetings started.

20.12.05 UR requested that everyone participated actively in sharing the screen shots and communicating about REAMIT meetings in social media.

RR reminded that, while communicating through social media, we should keep names of companies / institutions confidential while sharing the content of REAMIT online meetings.

## **REAMIT Advisory Committee (RAC) meeting (Chair: BED)**

KP welcomed attendees to RAC meeting. JB confirmed her presence at the RAC meeting. KP thanked JB for her input on the draft REAMIT progress report for the period January-June 2020. This would be discussed in RM 20.23.01 below.

KP summarised the progress made so far of the REAMIT project in the following order: WP T1, WP T2, WP T3, WP M, WP LT and WP C.

### WP T1 Adapting and pilot testing sensor technologies in agri-food supply chains

KP summarised the progress made so far in the implementation of WP T1.

#### *WPT1 Deliverable 1.1 Publication of open call*

20.13 The open call was published on the REAMIT website in four languages: English, French, Dutch and German. However, most companies recruited for pilot tests come from partners' own networks. Only I&R and Valorial confirmed they planned to recruit companies for pilot tests through the open call – ADRO Ouest (Egg consortium) and BbaMV (dairy products). Infographics on benefits from participation in REAMIT pilot tests was prepared and uploaded in the open call section of the REAMIT website. The open call deadline on the REAMIT website was extended until December 2020.

#### *Deliverable 1.2 Companies recruited from across agri-business supply chain (min 5 companies) for pilot tests*

20.14 The following five companies have been recruited for REAMIT pilot tests in 5 countries:

- Picnic (NL)

- Routhiau (FR)
- WD Meats (UK)
- WEYERS GMBH (DE)
- Manor Farm (IE)

#### *WPT1 Deliverable 2.2 Test Roadmap*

20.15 Partners at I&R have drafted Test Roadmap based on inputs from all pilot test leads, and have updated it systematically based on updates from pilot test leads. Test Roadmap contains the following information on each pilot test:

- Aim of the pilot test
- Partner companies involved
- REAMIT partners involved
- Technologies employed
- Role of technology partners
- Protocol for the pilot test
- Implementation calendar

In addition, I&R have developed a document 'Pilot Impact Assessment' summarising the impact of COVID-19 on each pilot test. 'Pilot Impact Assessment' is not a REAMIT deliverable though.

#### *WPT1 Deliverable 3.1 Working prototypes using sensor technology (5 REAMIT Pilot Tests)*

20.16.01 KP summarised the scenario for each of the 5 pilot tests and confirmed that prototypes using sensor technology are being developed for each of the pilot test:

- Working prototype for pilot test run by Whysor with Picnic in the NL
- Working prototype for pilot test run by UoN with Routhiau in France
- Working prototype for pilot test run by UU with WD Meats in the UK
- Working prototype for pilot test run by Whysor with Weyers GMBH in Germany
- Working prototype for pilot test run by UCD with Manor Farm in Ireland

20.16.02 RR confirmed that UU initially started the pilot test with Dunbia. However, due to company's own internal issues, after a period of 3-4 months, the company have decided to exit the REAMIT project. Luckily, the partners at UU were able to recruit for REAMIT pilot tests an equally big company called WD Meats.

20.16.03 KP confirmed there were several new pilot tests in the pipeline:

- UoN contacted Adria (France) to complement the Raman measurements by an interesting application called "Sym Previus" necessary for the validation of results.
- I&R and Valorial initiated talks with ADRO Ouest (France)
- I&R and Valorial made a proposal to BbaMV consortium (France) to design a pilot test focusing on egg powder. I&R and Valorial are now waiting for BbaMV consortium's response.
- Whysor contacted Meyer/QSL (NL)
- NTU contacted Tesco (UK)
- UU and BED contacted Metro (Germany)

#### WP T2 Big Data integration to reduce food waste (Deliverable 4.1 – 8.2)

20.17 LM summarised progress made under different deliverables in WP T2. There was progress in deliverables 4.1, 5.1, and 7.1. BED, Whysor and Levstone have contributed to the progress of this work package so far. Detailed progress would be presented in the dedicated WP T2 session.

#### WP T3 Business development of REAMIT technologies

20.18 FM confirmed there was progress in the implementation of this WP at UCD. During WP T3 meeting there would be detailed presentation from FM on conducting life cycle assessment for understanding the impact of REAMIT technology in Irish market or in the European market. Even though FM was present during Day 1 meetings, due to technical problems, the audience could not hear her. RR suggested to move on with the rest of the meetings to avoid causing delays.

#### WP Management

20.19 P confirmed the following information related to this WP:

- BED updated Project Handbook (available on REAMIT website), developed and circulated minutes from RAC/RWP/RSC meetings (15 – 16 January 2020, Rennes, France), undertook intermediate work package coordination, updated REAMIT risk log, developed and submitted to JS second REAMIT report and payment claim, prepared third REAMIT report, assisted partners with improving quality of reporting in eMS.
- Mrs Una Bruhann was appointed as a new REAMIT officer at JS of Interreg NWE Programme.
- 1 full time staff was recruited at BED in March 2020 (research Fellow – Dr. Lohithaksha M Maiyar), recruitment of a full time research assistant has been put on hold at ITT (a person has been selected but his start date has been postponed due to Covid-19), UCD has been in the process of appointing a post-doctoral researcher but the process has been put on hold due to COVID-19, new part time staff has joined the REAMIT team at Ulster University – Dr. Ruth Price would join REAMIT as clinical trials manager (she has previous experience in food research and will be assisting in coordinating future trials), James Dooley – Professor of Microbiology also has joined UU REAMIT team as part-time staff. His experience in microbiology will be invaluable in assisting in pilot tests with WD Meats.
- BED submitted second REAMIT report and payment claim to JS on 30 March 2020; In February 2020 Dunbia and Cottagequinn Farms informed BED that they would exit REAMIT; WD Meats joined REAMIT as sub-partner of UU; bi-weekly online meetings have been organised for fixed term staff in REAMIT (KP and LM from BED, WD from UU and SB from NTU).

#### WP Long Term

20.20 KP summarised progress under WP LT:

- NTU with assistance of BED, Valorial, Levstone, SenX, UCD, UU, developed and delivered REAMIT first Symposium in Nottingham, UK.
- Second REAMIT Symposium is being developed jointly by I&R and Valorial. The plan for the second symposium will be discussed on Day 2.
- BED has developed the first draft of the framework measuring the impact of benefits of technology on food waste.
- Two research proposals have been submitted inspired by REAMIT. BED submitted one proposal to UKRI. The proposal was developed in collaboration with NTU, UU, Levstone and WD Meats and proposed to study how technology was supporting fresh food supply chains in the UK in the light of COVID-19. BED submitted another large European proposal as project partner. That proposal was led by UCD and was unsuccessful.

#### WP Communication

20.21 KP confirmed that:

- Deliverables under WP Communication are advanced and follow progress made in other work packages. The only deliverable that has not been delivered yet is 'Policy briefings'.
- BED with support from REAMIT partners has submitted two applications for REAMIT stand at two exhibitions – CABS Research exhibition 2020 (March 2020, Nottingham, UK) and ICT 2020 Leading the Digital Age (December 2020, Cologne, Germany). However, due to COVID-19 the CABS exhibition has been cancelled and the ICT2020 exhibition has been postponed till 2021.
- REAMIT project partners were invited to present the REAMIT project at 11 external and internal events as specified in the progress report. These include:
  1. PI, Ram Ramanathan, delivered an invited research seminar on REAMIT at Cass Business School, London, UK, on 5 February 2020.
  2. PI, Ram Ramanathan, delivered a plenary lecture at the 3rd International Industrial Engineering and Operation Research (<http://ieconferences.com/>) Conference, Istanbul, Turkey, on 25 June 2020 on the topic, "Improving Operations and Sustainability of Agribusiness Supply Chains using Internet of Things sensors and Big Data Analytics." (Presented online).
  3. PI, Ram Ramanathan, presented a paper titled "A review of sensors for reducing waste in food logistics and supply chains", at the 27th EurOMA Conference, on 26 June 2020 – 01 July 2020, Warwick, UK (presented online at the publication workshop of the conference). The authorship was Ramakrishnan Ramanathan, Daniel Kelly, Bryan Gardiner, Gerard Corkery, Tahmina Ajmal, William Duffy and Joan Condell.
  4. Usha Ramanathan, NTU, presented REAMIT at UNIDAVI, Brazil: 'Importance of technology in food supply chains to reduce waste'.
  5. PM, Katarzyna Pelc, signed to represent REAMIT at Interreg NWE project 'Food Heroes Final Conference' on 18/03/2020, Brussels. However, the meeting was cancelled due to Covid-19.
  6. PM, Katarzyna Pelc, presented 'Introduction to REAMIT' to BMRI staff and research students, Business and Management Research Institute Day, on 13/01/2020, University of Bedfordshire, Luton, UK.
  7. PM, Katarzyna Pelc, presented 'Introduction to REAMIT' to BED master students in Logistics, Global Supply Chain and Logistics Management class, University of Bedfordshire, Luton, UK, on 25 January 2020.
  8. KP was invited to present REAMIT at 'Waste dinner' event on 16 March 2020 organised by MSc class students in Food Policy at the City University of London, London, UK. However, this event was cancelled due to COVID-19.
  9. PI, Ram Ramanathan, was invited to 'Total Food Conference' on 14 – 17 April 2020 in Nottingham, UK. However, the meeting was cancelled due to COVID-19.
  10. PI, Ram Ramanathan was invited to present REAMIT at 'Smart Food Matters' on 24 – 25 June 2020, London. However, the meeting was postponed due to COVID-19.
  11. SenX participated in a conference SMARTAGRI in France: <http://smartagri.bzh> where SenX was present in the demo area.

KP confirmed that two associated partners of BED have sent feedback on draft REAMIT progress report: Radboud University and Oost NL.

20.22.01 Feedback from Radboud University, The Netherlands: BED need to explain better why the project applies for a 12-month extension if the project is delayed by 6 months; BED needs to avoid delaying payment by LP to project partners due to unclear administrative procedures.

20.22.02 RR addressed comments from the Radboud University. He extended thanks to all partners for understanding the delays in payment and felt there was no reason for such delays to occur in the future. He promised to work towards improving internal systems at BED to avoid delays in the future. RR further explained that 12-month extension would be

needed for the REAMIT project to account for further delays due to the pandemic as at the time of the RSC meeting lockdown was still in vogue.

**20.23.01 Feedback from East Netherlands Development Agency (Oost NL):**

- JB asked what the actual delay of REAMIT was.
- JB noted that BED already established good contact with Picnic.
- Oost NL could help involve other companies in the NL to collaborate with REAMIT (e.g. organisations from other Interreg projects e.g. Blockchain project (however, there might be problems due to COVID-19 and companies may resist such collaborations at the moment).
- JB asked if REAMIT set the limit on maximum number of pilot tests.

20.23.02 RR confirmed it would be best to have as many pilot tests as possible. The idea is to minimise food waste and carbon footprint at a larger scale. The REAMIT project still has funds to support more pilot tests. Once the systems are established and can prove that food wastage can be reduced, more companies will be attracted.

20.23.03 KP asked if other partners received any feedback from their Associated Partners on the third REAMIT progress report. Partners confirmed that they had no feedback.

Associated Partner	Invitation responsibility -- Response
GIQS	BED -- Unavailable for meeting
Oost NL	BED -- Given
Radboud University	BED -- Given
Jean Routhiau	UoN – No feedback yet
Societe Des Transports EuropeensFrigorifiques (STEF)	UoN and I&R – No feedback yet
Bio search	UU – No feedback at this stage

RR asked partners to send draft third REAMIT progress report to their associated partners who have not yet sent their feedback yet and ask for feedback. RR thanked associated partners for their feedback and suggestions and closed RAC meeting.

**Action: UoN and I&R to send third REAMIT report to their associated partners and ask for feedback.**

**REAMIT Work package meetings (Chair: each WP lead)**

WP T1 Adapting and pilot testing sensor technologies in agri-food supply chains.

KP handed over to GM to lead WP T1 meeting.

20.24.01 GM confirmed that Deliverables 1.1, 2.1 and 2.2 have been completed. GM is still working on deliverable 1.2 (Recruitment of companies). Minimum five companies need to be recruited from agri-business supply chains for REAMIT pilot tests and these companies will be described in a document 'Companies recruited for pilot tests in REAMIT'.

GM confirmed that the following deliverables need to be submitted by June 2021:

*Deliverable 3.1: Working prototypes using sensor technology*

20.25 GM asked whether the REAMIT project would really develop new prototypes. He confirmed that this deliverable would be described in a document titled: 'Working prototypes using sensor technology' and containing the following information:

- Overview of sensors and scanning technologies
- Matrix of food used for analysis in REAMIT pilot tests (meat, fish, fruits, vegetables, etc.)
- Overview of the environment in which food is stored/transported: cold, hot, static, moving
- Conclusions

*Deliverable 3.2 User manual for each pilot*

20.26 This deliverable would be accompanied by 'User manual' for each pilot test. The user manual will contain the following information:

1. Introduction to the pilot test
2. Description of the pilot test
  - o Aim of the pilot test
  - o Partners involved in the pilot test
  - o Companies involved in the pilot test
  - o Technologies deployed in the pilot test
  - o Step by step implementation of the pilot test
3. Conclusions from the pilot test: what has been achieved

*Deliverable 3.3 Report on the pilot test and development of the sensor prototypes.*

20.27 The 'Report on the pilot test and development of the sensor prototypes' will cover the following information:

- Introduction
- Results obtained from the pilot tests
- Good practise examples and lessons learned from the pilot tests
- Recommendations
- Conclusions

GM handed over to KP who invited all pilot test leads to present the pilot test they were responsible for including the companies involved in the pilot test.

Pilot test 1, pilot test lead Whysor with Picnic, the Netherlands

20.28.01 IH and MS from Whysor presented the progress in the implementation of the pilot test with Picnic. They briefly introduced Picnic and the needs of Picnic, which would be addressed by this pilot test. These needs include: i) monitoring the temperature inside food boxes; and ii) measuring shock detection and how roughly food boxes inside the Picnic truck are handled.

20.28.02 IH confirmed that a sensor called EMS from Elsys was selected for deployment in the pilot test with Picnic. This sensor measures temperature, shock detection and humidity. Picnic collects data related to types of food in each food box and customer's complaints related to each food box. This data will be transported to REAMIT cloud, and from the cloud it will be downloaded to the Big Data hub at BED.

20.28.03 MS confirmed that the pilot test with Picnic had been further defined. Whysor asked BED to order 20 EMS sensors and batteries. These sensors will be installed in food boxes inside the Picnic truck. Whysor needs 2 – 3 weeks for configuration of sensors. Expected start date of the pilot test (with 20 new sensors) is August 2020.



The new sensor is a mini sensor. It also has a battery, which constitutes the biggest part of the sensor. It can be easily hidden and fixed in the food box. This sensor can measure humidity, temperature, acceleration and position. The combination of the last two parameters (acceleration and position) shall help determine how the food box is treated. 20 sensors are connected and data from these sensors is transmitted using KPN LoRaWAN (which has coverage in the entire Netherlands) to the online Whysor cloud. From there, data can be later transferred to a server at BED. It is important to decide whether it is wise to set alerts now. Or otherwise, it needs to be decided when alerts will be sent. This can be done with the help of a functionality called complex event processor available in the Whysor cloud to generate alerts based on temperature thresholds or acceleration thresholds. These alerts are meant to generate new information for the pilot test partner – Picnic.

20.28.04 Frank Gorte (FG) from Picnic confirmed that during the pilot test they bootstrapped this. Ultimately the runners (delivery men and women) are carrying their own runner device. Ideally, the alerts will go through the Picnic backed system to the runner's device. Separate systems will need to be created to bootstrap it. The number of sensors will not be that big to completely develop these backed systems. The same applies for the data cloud. Full integration of the data should not be the main objective yet, some amount of integration should be made with the data warehouse of Picnic. It should be easy to separate the data into tables for analysis.

20.28.05 MS confirmed that Picnic can use the REAMIT website and use it as an export system for sensor data. There should be some addition to the existing architecture on how the data with Picnic can be used or exported.

20.28.06 MS asked FG how Picnic can provide their data to REAMIT for analysis.

FG said that Picnic measures as much as possible throughout the supply chain and cannot share GPS or address of data. Picnic can share data which contains information about products, volume, weight, density, type of product (liquid or a lattice which has air inside), fill-up rate of the toads, amount of icepacks added (jellified ice-packs provide cooling), time stamp throughout the change, time of pick-up of food in the warehouse, last pick-up done, time when the load leaves the centre and enters the truck. Although it is unreliable data point as it is not measured but entered. Temperature setting inside the truck, time when the truck arrives at a hub, time when the truck leaves the hub, time when the truck arrives at customer's address. This can be augmented with weather data.

MS: Since the distance is 1-2 hours of travel, weather data from the hub should be sufficient to estimate weather data of the truck location.

FG: The distances may be shorter or longer. Weather data is also available in the Picnic data warehouse.

20.28.07 RR thanked MS for presenting the pilot test with Picnic. RR asked what Picnic expected from the REAMIT project and how REAMIT project could help satisfy the needs of Picnic.

MS responded that Picnic's ultimate objective was to deliver fresh products to the customer's house in a way, which was cost efficient and environmentally friendly. Temperature control was a key parameter to achieve this objective. In a typical supermarket you can find products stored in a cool system at 4 degrees C. Often, products in supermarkets are stored in a cool system also at 8 degrees C. Picnic is able to deliver groceries to customers' houses using a closed, chilled box. Many of the products which are stored in ambient environment in a supermarket, are stored in chilled environment in Picnic, and these products are transported to customer's doorsteps in temperature of 4 degrees C, or lower. Ideally, Picnic aims to achieve a situation where the only time when there is a chance of food quality degradation, is the time when food is in between the customer's front door and their refrigerator, as during this time the product is not kept in chilled environment.

MS added that other risk areas for Picnic are when a lid of the food-box is not completely closed, or when the amount of ice-pack required to keep the amount of cooling required in the lorry is underestimated (NB Picnic is aware that using ice packs in its lorries has an impact on the environment).

RR asked whether Picnic was able to deliver food to longer distance customers.

FG said that Picnic operates e-trucks and the key parameter was the battery inside each truck. The battery makes it possible for a truck to drive at 50 km/h. With 4, 5 or 6 ice-packs inside a truck, food-boxes are kept cool for hours. Adding weight to a lorry is not very useful. The system has the potential to scale up and operate longer delivery routes. However, the key in this system is the optimal number of ice-packs rather than longer routes.

FG rank shared his experience how Picnic has operated during lockdown due to COVID-19. FG has been involved in company's scale-up and hyper-growth due to arranging deliveries to substantially increased number of customers and orders. Most of customers in pre-pandemic time had their orders finalised just before 10 pm on a day before delivery. However, during the pandemic peak period, many customers ordered food much in advance. So, the whole forecasting algorithm developed in Picnic was useless. Many new customers registered in Picnic, they downloaded the Picnic APP and used it to order food. A future plan of establishing a fulfilment centre was anticipated and a new fulfilment centre has been opened recently to cope with increased orders. Now the situation is back to normal and hopefully it will remain this way.

20.28.08 MS explained that it is important to sort out what combination of position and acceleration should be used in order to translate it to shock detection. MS confirmed that BED would purchase 20 sensors and batteries to be used in Picnic pilot test.

KP explained that purchase of 20 sensors for Picnic has been put on hold at BED due to a series of questions raised by finance and procurement teams at BED. They included questions of ownership, warranty and insurance of equipment during transit from Sweden to the NL and from the NL to UK.

KP asked MS and FG how delay in delivering sensors would affect the pilot test with Picnic.

MS and FG confirmed that summertime was ideal for data collection because they would get data for different environmental conditions (sun, humidity, rain, etc.) unlike during other seasons, to see the product decay characteristics. The testing could also be done in winter, except that Picnic would be using smaller amounts of ice-packs per load in winter and that the day time available for measuring the parameters would be more in summer than in winter. The difference between outside temperature and inside temperature was more substantial in summer and a greater number of data points for say 4-weeks period is possible in summer. MS will need some time for endurance tests with summer and expect to start in July-August or probably August if there is delay in the sensors delivery. It is good to resolve ownership issues first given the cost of each sensor is approximately £45 (bulk buy at least 100) or £62 per sensor. Whysor wants to have this resolved as soon as possible to start testing and implementation.

RR confirmed that BED would resolve this within the next weeks.

**Action: BED will resolve purchase of sensors for pilot test with Picnic within 2-3 weeks.**

20.28.09 RR asked whether Picnic could be approached at a later stage for data to create case studies.

FG said yes and confirmed there were a number of things that still needed to be determined in the pilot test with Picnic: i) at what point alerts will be sent and to whom (based on the analysis of shock detection / acceleration); ii) personalised cooling profile per food-box needs to be developed (based on the analysis of outside weather conditions combined with data on temperature inside food-box during transport).

20.28.10 MS confirmed roles and responsibilities of Picnic, Whysor and BED in the pilot test with Picnic:

Roles and responsibilities of Picnic:

- Installing sensors inside food boxes
- Administration/collection of information from all sensors in all food boxes

- Administration/combination of other information and data from the Picnic system on each food box (location, type of food in each food- box, complaints linked to each food box)

Roles and responsibilities of Whysor:

- Configuration, registration and endurance test of the sensors
- Delivery of sensors to Picnic
- Maintenance of the sensors inside Picnic's trucks
- Online storage and visualisation of data from Picnic at reamit.whysor.com
- Transferring data to Big Data hub at BED

Roles and responsibilities of BED:

- Purchase of 20 sensors and batteries
- Development of Big Data hub

20.28.11 RR confirmed that data analysis will be conducted by SenX, ITTalee, Levstone and BED independently based on their own understanding. LM at BED could be involved in cleansing the data and providing the data in a common structured format.

MS confirmed that Whysor preferred to do their own cleansing of raw data.

RR agreed and confirmed that all four technology partners would have their own ways of cleansing and analysing data. BED could perform any common data handling activities that would remove any repeated functions at individual partner level. The specific roles of each partner could be agreed upon at a later stage.

20.28.12 MS confirmed the following challenges with the pilot test with Picnic that need to be considered:

- The importance of privacy of consumers (GPS data sharing concerns)
- Delay in purchasing sensors at BED
- The impact of COVID-19: lockdown and work from home restrictions have had impact on the pilot test with Picnic but partners hope to be able to move on with the pilot test soon and recover the time 'lost'

20.28.13 FG made a presentation about Picnic and the company's business model. Contrary to a traditional supermarket, Picnic draws inspiration from the milk-man last mile delivery to deliver products to the customer's doorsteps via a last mile radar delivery system. Picnic has 7 fulfilment centres and more than 60 hubs spread across two countries. The delivery cost reduction from reduced food wastage (they don't have to maintain excessive inventory) offsets the additional costs involved in the last mile deliveries.

Q&A session about Picnic and the pilot test with Picnic

Q1: How does Picnic keep their prices competitive compared with supermarket prices?

FG: By focusing on efficient operations throughout the supply chain.

Q2: Does Picnic keep track of environmental impact?

FG: Picnic has not specifically considered environmental impact study but certainly the current set-up is environmentally friendly because of less food waste and less transport involved. Picnic's electric trucks also contribute to Picnic's position as environmentally friendly company.

Q3: Does Picnic have physical fulfilment centres or is it a virtual centre where Picnic gets all information (demand for food ie food orders and supply of food from food producers/suppliers).

FG: It is a physical building of 8000 square metres. It is an industrial supermarket.

Q4: Do all fulfilment centres have the same products?

FG: More or less except for some local differences based on local food preferences.

Q5: How does Picnic handle traffic?

FG: On a typical day, the traffic is known and predictable. So, it is not much of an influence because Picnic also learns from previous deliveries how long it takes to deliver the products to achieve a second-precise delivery accuracy.

Q6: Would the 20 sensors provided by BED be placed in one truck or in multiple trucks?

FG: Picnic plans to place the sensors inside one truck.

Q7: Does Picnic face any competition in the area?

FG: Picnic has a good business model unlike traditional supermarkets with which Picnic is able to capture decent market share.

#### **Actions for the pilot test with Picnic:**

1. **BED to finalise purchase of 20 EMS sensors from Elsys and 20 batteries.**
2. **Whysor to do configuration of sensors.**
3. **Whysor to install 20 sensors in the Picnic's truck.**
4. **Whysor to connect 20 sensors and arrange for transmission of data from sensors using KPN LoRaWAN (which has coverage in the entire Netherlands) to the online Whysor cloud.**
5. **Whysor, BED, Levstone to arrange for data to be transferred from Whysor cloud to Big Data server at BED.**
6. **Whysor and BED to decide whether it is wise to set alerts now (with the help of a functionality called complex event processor available in the Whysor cloud to generate alerts based on temperature thresholds or acceleration thresholds. These alerts are meant to generate new information for the pilot test partner – Picnic.**
7. **Whysor, BED and Picnic to develop a system to generate alerts for Picnic.**
8. **Whysor and BED (with assistance from ITT and SenX) to integrate data obtained from sensors with data in warehouse of Picnic.**
9. **BED (with assistance from Whysor, ITT and SenX) to separate the data into tables for analysis.**

#### Pilot test 2, pilot test lead Whysor with Weyers GMBH, Germany

20.29 MS presented the pilot test with Weyers GMBH. Weyers GMBH is fresh fruits and vegetables transporting company, which transports these goods from where they grow, through warehouses to supermarkets. The company is based in several countries including Germany and the Netherlands. Weyers GMBH were provided with VOC and GPS sensors (from REAMIT) in January 2020 by Whysor. These sensors would be built into their trucks from where the data will be received and transported to the REAMIT Whysor cloud. The sensors will also measure VOC, CO2, temperature, pressure and Lux. Data will also be collected on weather conditions and employees' inputs. The connection to the cloud is through a gateway. The situation with this pilot test in July 2020 is the same as it was in January 2020. The communication from their side is very poor now due to COVID-19 and Whysor finds it challenging to continue the pilot test with this company.

MS confirmed that it was difficult to re-establish good communication with Weyers, following COVID-19 crisis. MS recently got an update from Weyers that Whysor's contact person at Weyers was back at work only last week (end of

June 2020). MS planned to approach Weyers to discuss whether they were still interested in continuation of REAMIT pilot test.

RR confirmed that it was not unexpected to see such outcome given the current crisis situation due to COVID-19. We would hope that Weyers GMBH came back to us after they stabilised. RR asked whether REAMIT has already provided some sensors to Weyers GMBH.

MS confirmed that REAMIT has provided sensors and gateways to Weyers which have been installed in their storage room. Whysor planned to also install them in Weyers trucks.

#### **Actions for the pilot test with Weyers**

- 1. Whysor to re-establish contact with Weyers to check if they are still interested in REAMIT project.**
- 2. Whysor to install VOC and GPS sensors provided by REAMIT (January 2020, by Whysor) in Weyers trucks.**
- 3. Whysor and BED to arrange for receipt of data from sensors and transport of data to the reamit.whysor cloud.**
- 4. Whysor to arrange collection of data from sensors on VOC, Co2, temperature, pressure, Lux, weather conditions and employees' inputs.**
- 5. Whysor to arrange the connection to the cloud through a gateway.**

Break for 30 minutes

#### Pilot test 3, pilot test lead Ulster University with WD Meats, UK (Clostridium bacteria)

20.30.01 Mark Logan (ML) from WD Meats made a presentation of the company. WD Meats is a family owned company established in 1979; it slaughters 1300 cattle per week, employs over 460 employees, and is a market leader in Northern Ireland. It produces beef (dry aging/maturation processed, fresh and frozen mince, fresh and frozen dice, stir-fry beef, stamp beef, portion-controlled products controlled by weight and size, packed steaks, thermoformed steaks) and delivers it to supermarkets.

ML confirmed that two important issues would need to be addressed in WD Meats, which contribute to biggest food waste:

- detection of clostridium bacteria
- monitoring of meat quality in dry aging chamber

ML confirmed that REAMIT pilot tests would focus on addressing these two challenges of WD Meats.

In the Clostridium bacteria pilot test, WD Meats are looking for a solution where testing of meat can be done in a laboratory, say for 48 hours, to determine the amount of clostridium bacteria in meat, and based on it to predict spoilage and quality of meat and consequently determine ways to isolate the affected meat.

#### **Q&A for pilot test with WD Meats**

Q1. How long do you think the trials will last?

ML: Dry aging trial may take a few weeks. Clostridium trial may take a little bit longer because it will need identification of the right technology.

JC: The sensors for dry aging was planned to arrive from Mathias, unfortunately it has not arrived yet. So UU is currently on the search for alternatives.

RR reminded that the ultimate goal of all REAMIT pilot tests should be reducing food waste and emissions of CO2 as per the goals of the REAMIT project.

ML and JC reassured that by effectively conducting both pilot tests, reduction of food waste can be as much as 100,000 tons of meat per year.

**Actions: JC and WD to identify an alternative sensor and sensor supplier to the one promised by Mathias from Freshdetect.**

JC further mentioned that WD Meats leases out the transport to a company called Blairs. UU are planning to work with data from Blairs to monitor quality of food during transportation.

RR confirmed that he supported this idea as something that could be addressed later or separately from the pilot tests with WD Meats.

**Action: JC to pursue with WD Meats and transport company Blairs for a transport pilot.**

WD from UU presented the progress in the implementation of Clostridium pilot test with WD Meats:

20.30.02 Clostridium bacteria develops in meat inside plastic packaging. This bacterium makes the package to bulge. Bacteria produces gases, including CO<sub>2</sub>, and creates anaerobic condition inside the package. Meat infected by clostridium bacteria is not harmful because bacteria does not produce any toxic gases. However, technically this meat is inedible because of its taste and smell, which significantly contributes to food waste. Many countries have the same problem. It is suspected that clostridium bacteria come from soil. The hides of animals, as they are brought into the abattoir, are washed, and animals generally do not like this procedure, and it makes them stressed. Avoiding washing the hides of animals may reduce stress and translate into better quality of meat, which may potentially reduce the amount of bacteria in the meat. It may be then possible to prioritise the meat to be sent out first to supermarkets, or to be removed immediately. Prof. James Dooley, a microbiology specialist, has been recently approached by UU and invited to join the REAMIT team. He would work on microbiology experimentation – Polymerase Chain reaction or DNA extraction. Also, UU is currently working on identifying the right sensor, which can be installed properly and send alerts about clostridium bacteria. However, UU team are still unsure what data should be collected by this sensor.

Q&A about the pilot test focused on Clostridium bacteria

Q1: What volume of meat is affected by Clostridium bacteria?

WD: It is volume of meat which is worth a few hundreds of thousand pounds per year (for WD Meat).

Q2: What happens with meat when it is affected by Clostridium bacteria? Is it still eatable and sold or becomes waste?

WD: It depends on how long the meat is kept inside the vacuum sealed packaging. It can be eaten immediately, but most likely it becomes inedible because of its smell and taste.

Q3: At which moment the company realises the meat is affected: when the meat is still within the company, transported or on the supermarket shelf?

WD: It could be any of them. It depends on how long the meat sits in the company and in what temperature it is stored. This bacterium only grows inside the vacuum packaging. So, it is not possible to know that it was there when the meat was kept outside of the package, unless it was tested. The higher the temperature when the meat is inside the vacuum packaging, the quicker and greater is the growth of bacteria. Some bacteria will be detected in the factory and some will be detected in the retail stores.

Q4: How long will the packaged meat stay inside the company before it is distributed? Is it hours or days?

WD: Not 100% sure. It maybe a few days.

JC: It is less than a week, and most probably it will go out on the same day or the next day.

Q5: Will the sensor be able to detect bacteria through the foil?

WD: At the moment, we are not sure. Realistically, the meat may be tested even before packaging, while it is still on the conveyor belts. It may be possible to find some way to wash something off the meat while the meat is on conveyor belts.

Once the meat has been packaged, the sample cannot be taken because it will disturb the vacuum and the meat will get spoiled in such case. It is best to test for bacteria in a common area (such as conveyor belts), where all the meat is going through.

Q6: Is the testing conducted as part of food safety requirements to maintain meat quality levels, before the meat is packaged? This could help narrow down your search for the right sensor and data to be collected from meat samples.

WD: WD Meats perform tests for food safety inside the plant by acid spraying procedures that kill the bacteria. The problem is the frequency of fogging of the meat since it damages the working area and machines, and the plant cannot run while the acid is being sprayed.

Q7: You mentioned that there would be an alert generated through the sensors. What kind of alert would you be looking for?

WD: The alert could be made when meat is beginning to expire due to bacteria. The alert could be made before fogging to take necessary action for fogging. Secondly, the alert can be used to prioritise or redirect the meat to the nearest supermarket/restaurant before it goes to waste.

Q8: Does all meat need to be packaged?

WD: Not sure. Vacuum makes the bacteria expire faster than other methods.

20.30.03 WD summarised the status with this pilot test and confirmed that UU was waiting to get on the site and start off with PCR (PCR stands for Polymerase Chain Reaction i.e. a method used in this case to take samples of meat DNA for detailed analysis). There are commercial kits available for detecting this bacterium specifically with PCR. The lab at UU can be used for doing this faster than doing it in the company. But, this would not be a long-term solution. The idea is to first find out the method to detect the bacteria and then determine the sensing equipment that could help detect without the laboratory testing.

20.30.04 WD confirmed roles in pilot test with WD Meats: UU's role is to select the right sensor and find ways to detect the bacteria. WD Meats' role is to provide the permission to run the tests on the company's site.

20.30.05 WD confirmed there were several challenges related to this pilot test. First, other people have already been able to detect the bacteria using PCR or DNA extraction, but not through ambient ways. Second, COVID-19 has had an impact on the progress of activities within the pilot test, mainly since UU's team was not able to access the company's site for several months. As soon as WD Meats reopens, UU team will enter the company's sites to assess the sites and determine where to install the sensors.

#### **Actions for the pilot test with WD Meats (Clostridium bacteria)**

1. **As soon as it is possible (due to COVID-19 lockdown restrictions) UU to access the sites of WD Meats to determine where to install the sensors.**
2. **UU to carry out PCR analysis on meat samples from WD Meats in the laboratory of UU (this will be a temporary solution to determine the method to detect the bacteria.**
3. **UU to identify an alternative sensor and sensor supplier to the one promised by Mathias from Freshdetect.**
4. **UU to determine the right sensing equipment that can help detect Clostridium bacteria without the laboratory testing i.e. in ambient environment on the sites of WD Meats while the meat is still on the conveyor belts.**
5. **UU to use the sensing equipment to detect Clostridium bacteria on the sites of WD Meats.**
6. **UU to pursue with WD Meats and transport company Blairs for a transport pilot.**

Pilot test 3, pilot test lead Ulster University with WD Meats, UK (Dry aging chamber)



20.31.01 WD introduced a dry aging chamber pilot test with WD Meats. Meat would be hanging in the dry aging room for about three weeks. The air extraction and the cooling fans are generally on one side of the room, which creates a gradient of different temperatures, oxygen levels and humidity across the room, leading to meat spoilage. To solve this problem, the pilot test would install temperature and humidity sensors across different points in the room. UU has approached a company called Tsenso, and Tsenso has offered to send out its sensors to UU to be used in this pilot test. However, due to internal problems within Tsenso, the sensors have not yet been delivered and UU has started to look for alternative options. UU plans to use LoraWAN connectivity for transferring data from sensors to the cloud. Once this has been set up and the analytics done, UU intends to approach to solve the problem by generating alerts indicating the meat which is spoiling fastest in the dry aging chamber or provide solutions to reconfigure the dry aging chamber to sustain consistent temperature and humidity gradients. Whysor has sent to UU an EMS sensor that shall be tested for this pilot test. UU will work with Levstone and Whysor in order to install this sensor in a dry aging chamber and to transmit data from this sensor to the cloud.

20.31.02 WD confirmed the status of this pilot test implementation: UU is currently waiting for WD Meats to open its sites to UU so that UU team can install sensors within the company's sites.

20.31.03 WD confirmed roles in the implementation of this pilot test: UU installs the sensors and WD Meats allows UU to use the chambers.

20.31.04 WD confirmed the following challenges with the implementation of this pilot test:

- Due to COVID-19, WD Meats remained inaccessible for UU team as the company was locked down for outsiders
- Procurement process at UU has been frozen for several months

20.31.05 RR suggested that UU teamwork with Whysor and Levstone on choosing sensors and fitting them inside WD Meats sites. This is to ensure uniformity and consistency in these tasks across all pilot tests.

**Action: UU team will work with Whysor and Levstone on choosing sensors and fitting them in the sites of WD Meats. This is to ensure uniformity and consistency in these tasks across all pilot tests.**

Q&A

Q1: Is the focus of this pilot test driven by the needs of WD Meats? Does this mean that other (similar) companies face similar problems?

WD: Yes, the focus of this pilot test is driven by the needs of WD Meats. Many similar companies face similar problems, especially with clostridium bacteria. As for the dry aging chamber, it all depends on how these chambers are configured with temperature and humidity levels.

#### **Actions for the pilot test with WD Meats (Dry aging chamber)**

1. Once WD Meats opens up again, UU to access the sites of WD Meats to assess where to install sensors in a dry aging chamber.
2. UU to work with Whysor and Levstone on choosing the right sensors suitable for fitting inside WD Meats's dry aging chamber.
3. UU to purchase sensors suggested by Whysor.
4. WD Meats to facilitate installation of sensors by UU.
5. UU to install sensors in dry aging chamber.
6. Whysor and Levstone to ensure uniformity and consistency in connecting sensors to cloud across all pilot tests.



Pilot test 4, pilot test lead UU (3D Fluorescence sensor), UK

20.32.01 WD said that 3D Fluorescence sensor is usually used in medical environment. It is too bulky and not suitable for certain scenarios, and it is also very expensive technology. If used in analysing quality of meat, 3D Fluorescence sensors can detect the total amount of bacteria on meat.

WD confirmed that UU discussed with Matthias Heiden procuring sensors for 3D fluorescence pilot test, even though UU does not yet have a pilot test lined up with any specific company.

RR suggested going ahead with this pilot test.

20.32.02 TA suggested another German company for procuring hand-held device as a second option. Chelsea (company) do not have experience with sensors used in food context. TA was concerned about dealing with a bankrupt company when procuring sensors from Matthias Heiden. WD suggested that the sensors they provide can be used for producing a proof of concept. Ulster will need to decide in the next few months which technology they will go with. FreshDetect, Flurotech or the German tech company TA mentioned or Chelsea Technology. Once this has been done, we can take this pilot test forward.

20.32.03 RR said that by the next RAC/RWP/RSC meeting, we hope to have good progress with this pilot test. He confirmed that in the next few months the project would need to make some progress in the implementation of 3D Fluorescence pilot test, either by choosing one sensor supplier from among several companies (FreshDetect, Flurotech, the German tech-company and Chelsea Technology – the last three companies have been suggested by TA) or by listing pros and cons of each approach. If the companies are interested to commercialise their technology by acquiring patents etc., we would need to think about it deeper.

**Actions for the 3D Fluorescence pilot test**

1. **UU to action procurement of two 3D Fluorescence sensors from Matthias Heiden from FreshDetect.**
2. **In parallel, UU to explore other possibilities of procuring 3D Fluorescence sensors from the following companies: Chelsea Technology (German company suggested by TA), Flurotech (company in the UK suggested by TA) and German tech company (suggested by TA).**
3. **UU to develop a document listing pros and cons of 3D Fluorescence sensors offered by each of the companies: FreshDetect, Chelsea Technology, Flurotech and German technology company.**
4. **UU to investigate whether the company selected to provide 3D Fluorescence sensors for pilot test with WD Meats is keen to commercialise their technology by acquiring patents. If yes, UU to develop a list of steps necessary in the process of patent acquisition.**

Pilot test 5, pilot test lead University of Nantes (Raman Spectroscopy), France

20.33 Ali Assaf (AA) from the University of Nantes confirmed that Raman spectroscopy is an optical method to detect chemical composition of product samples, in this case food product samples. The sensors will be integrated in a food truck and will provide data on the quality of food during transportation. This data will be further used for analytics.

In the Raman Spectroscopy pilot test run by UoN, the Raman sensor along with classical sensors (measuring temperature and humidity) will be used. The first pilot was scheduled to start in March 2020 with Routhiau (fresh food producer company in France). However, due to COVID-19 this pilot test has been put on hold. Also, due to COVID-19 and transportation delays in France, UoN has only recently received some elements of the spectrometer equipment. In this pilot test UoN works with chicken samples from Routhiau. The applied technology considers bacterial count to validate measurements. The pilot test is planned to reassume in September 2020. The overall delay is estimated as 6 months.

**Actions for the pilot test at UoN with Raman Spectroscopy**

1. **UoN to complete purchase of all elements of Raman spectrometer.**
2. **UoN to start the first round of measurements with Routhiu to test Raman set-up.**
3. **Whysor and SenX, to support UoN with transmission of data from Raman sensor to REAMIT cloud.**
4. **UoN to agree with Whysor frequency of data transmission from sensor to REAMIT cloud.**
5. **BED and Whysor to help UoN with data transmission from sensor to cloud.**

Pilot test 6, pilot test lead UCD (Cyber bar), Ireland

20.34.01 Saptarishi Chakravarty (SC) from UCD made a presentation about his master's thesis work, which focuses on Cyber bar technology.

20.34.02 Shane Ward (SW) from UCD confirmed that COVID-19 caused major problems and delayed the implementation of the Cyber bar pilot test. Due to COVID-19, there has been very strict protocol at UCD, which restricts staff from UCD from participation in any field work during the pandemic. The situation will be reviewed in September. COVID-19 has also delayed hiring a post-doctoral scholar at UCD who would work on REAMIT, but hopefully the new staff member will be in place by the time the Cyber bar pilot test is up and running.

**Action: UCD to send LP an update of the situation with developing cyberbar pilot test.**

20.35 KP thanked all partners and companies for presenting the progress with the implementation of REAMIT pilot tests. She asked partners for information about status of pilot tests in the pipeline.

AA from UoN and GM from I&R updated partners about new pilot tests in France:

- Some end users in France (i.e. Cooperative BbaMV which deals with milk and dairy products) are interested in participating in REAMIT pilot test. However, due to pandemic there has been very little interaction with them recently. UoN has sent a proposal to BbaMV and is waiting for their reply and final decision after COVID-19.
- Egg producer company in France (IGRECA) has been approached and invited to participate in REAMIT pilot tests. Also, sea-food producer company is interested in participating in REAMIT pilot tests if Raman sensors can produce good results.
- A company called Adria is interested in collaborating with REAMIT as they are willing to incorporate Raman technology in their prediction model. However, ADRIA refused to be part of a pilot test due effects of COVID-19. However, one partner from the consortium is willing to test one batch of sample with Raman spectroscopy, and if they find the results positive, they are ready to engage in a full pilot.
- French partners have experienced difficulties in recruiting new companies to participate in REAMIT pilot tests, given companies hit by COVID-19 prioritise their daily business nowadays, not research.

**Actions:**

1. **UoN and I&R to confirm whether BbaMV (milk and dairy products consortium) will participate in developing a new pilot test in REAMIT.**
2. **UoN and I&R to confirm whether IGRECA (egg producer in France) will participate in developing a new pilot test in REAMIT.**
3. **UoN to confirm whether sea-food producer company will participate in developing a new pilot test in REAMIT using Raman spectroscopy.**
4. **UoN to confirm whether one partner from Adria consortium will test one batch of sample with Raman spectroscopy (and if they find the results positive, whether they will engage in a full pilot).**

RR:

- asked Whysor whether there was an update from Meyer QLS. IH responded that Whysor's contact person in this company has been made redundant due to COVID-19 issues and Whysor received no updates since then.
- asked NTU whether there was any update about Tesco. UR responded that due to COVID-19 NTU's contact person in Tesco conveyed that their operations would be delayed. NTU will keep trying to bring new pilots from other companies such as Pepsi and few other smaller consortia from their networks and other projects, once the COVID-19 situation become less severe.

RR updated partners that another attempt to approach METRO through Tsenso has not gone through because Tsenso was out of contact due to COVID-19 and this affected the contacts with METRO.

#### **Actions:**

1. **Whysor to approach Meyer QLS to find out if Meyer QLS will participate in the REAMIT pilot test.**
2. **NTU to approach Tesco to find out if Tesco will participate in the REAMIT pilot test.**
3. **NTU to approach Pepsi to find out if Pepsi will participate in the REAMIT pilot test.**
4. **NTU to approach smaller consortia in NTU's networks and projects to find out if they will participate in REAMIT pilot tests.**
5. **BED to approach METRO through Tsenso to find out if METRO will participate in REAMIT pilot test.**

RR acknowledged difficulties that pilot test leads and companies were facing and suggested that a gentle regular interaction would be sufficient to ensure the pilot companies remembered about the REAMIT project and came back to us when they had sufficient time and resources. RR confirmed it was not advisable to push the companies too much. RR confirmed that JS was also informed about difficulties faced by the REAMIT project and its partners in the implementation of WP T1.

20.36 GM from I&R presented a document which is being developed by I&R (based on inputs from all pilot test leads) on the impact of COVID-19 on REAMIT pilot tests.

RR thanked everyone for actively participating in all pilots despite very difficult times during the pandemic.

20.37 Dr Pat Doody, Director of IMaR, at IT Tralee made a presentation about ITT. He introduced IMaR and its structure, as well as different projects at Intelligent Mechatronics and RFID (IMaR) group. He confirmed that the recruitment of a research assistant from India was being finalised. The candidate was selected but was awaiting completion of VISA process. ITT is excited to perform analysis for REAMIT as soon as there is data available from pilot tests.

#### **Q&A**

RR confirmed that BED would be interested in working with ITT on aquaculture projects. Since IMaR also had expertise in sensors and RFID, RR asked whether IMaR would support BED in selecting sensors.

PD answered that ITT was an expert in this field, right from high frequency to active tags. ITT could offer support in selecting the right kind of technology for the right scenario.

**Action: BED to work with ITT for suitable collaboration opportunities in aquaculture, outside of REAMIT.**

RR thanked participants for active participation in Day 1 meetings. He confirmed that an updated agenda for Day 2 meetings would be sent to all attendees later that day.

\*End of Day 1\*

## Day 2 – 9 July 2020

RR welcomed attendees to the second day of RAC/RWP/RSC meetings. He confirmed that the second day of REAMIT meetings would run according to the updated agenda circulated by KP in the evening of the previous day.

RR handed over to LM who presented progress in the implementation of WP T2 as per deliverables.

### **WP T2 Big Data integration and application to reduce food waste**

*WPT2 Deliverable 4.1 Creation and launch of interface for each of the 5 pilot tests for collecting data from sensors and sending it to cloud for use in a transnational Big Data infrastructure (by July 2021)*

LM presented the progress of this deliverable in each pilot test:

*Two pilot tests led by Whysor with Weyers (Germany) and Picnic (The NL)*

20.38.01 Whysor has developed a REAMIT project dashboard which is being currently used to receive data from sensors installed in the German pilot test with Weyers GMBH. The Dutch pilot test with Picnic has slowly begun to reassume after COVID-19 and sensors are yet to be installed. The sensors have been installed on the site but not inside trucks. Whysor hopes to have sensors installed in trucks too and to receive data from truck, as soon as COVID-19 situation and lock-down have relaxed.

LM confirmed that REAMIT cloud currently receives data on temperature, humidity and VOC. The REAMIT team will need to prepare a scenario enabling the REAMIT cloud to receive and manage other types of data received from all REAMIT pilot tests. Even though it maybe early at this stage to have such discussion, nevertheless it is good to start planning this kind of scenario to obtain new inputs, ideas and clarifications in due course.

*Pilot test led by the University of Nantes (with Routhiau), France*

20.38.02 Whysor and SenX have supported UoN with sending data to REAMIT cloud. However, due to COVID-19 no data has been collected yet.

*Pilot tests led by Ulster University (with WD Meats), UK*

20.38.03 Whysor are preparing a list of potential LoRa enabled sensors, which can track temperature and humidity and will be used in the WD Meats dry-aging pilot test. Prof. James Dooley, microbiology expert at UU, has agreed to help find a suitable sensor for the Clostridium pilot test. Hence, discussions about data sharing and transporting to cloud is yet in preliminary stages and not seriously thought through at this point.

No further updates from other pilot tests have been provided regarding sending data to cloud.

**Action: REAMIT sub-team (BED, Whysor, SenX, Levstone, ITT) to develop a scenario enabling the REAMIT cloud to receive and manage other types of data received from all pilot tests (not only data on temperature, humidity and VOC).**

20.38.04 Levstone has implemented and added Google variant encoding to Levstone's platform – Warp 10 to help efficiently transfer data to the cloud. They have added a caching mechanism (accelerator) and other developments to their technology to help transfer small and large data in timely manner or with minimum delay.

**Action: Levstone to work with Whysor in using Levstone's new platform for REAMIT.**

*WPT2 Deliverable 5.1 Big data platform with capability to collect and store sensors data from all REAMIT corridors (January 2020 – July 2021)*

20.39 LM confirmed that based on inputs from Whysor, ITT, Levstone and SenX, BED has developed specifications of equipment for Big Data hub and software platform at BED. BED is in the process of purchasing integrated physical equipment (three quotations have been requested and the specifications have been finalised based on best price offer, in stock options, convenient deliveries and supplier location). In the recent days (on 28 June 2020) BED received approval from the IT department at BED and has also requested quotations for software licensing (for Windows server SQL 2019 and Windows server standard 2019).

**Actions for WP T2:**

1. **BED to finalise purchase of equipment to build the Big Data hub at BED.**
2. **BED to finalise purchase of software necessary for the Big Data hub at BED.**
3. **BED (with the help of ICT at BED) to prepare a room at BED (Luton campus) where the Big Data hub will be mounted.**
4. **With the help of equipment supplier, BED to finalise building up of the Big Data hub, including installation of software.**

*WPT2 Deliverable 7.1 Launch of smartphone App for linking food owners, truck drivers and warehouses (January 2020 - July 2021)*

20.40 LM confirmed that three sensors have been tested for logging data to the cloud by Levstone. The data is in raw form with minimum manipulation with no alerts and feedback to the Mobile App. The next phase will be to perform data collection and management. A web progressive app for visualisation and data presentation is being developed. The work for data presentation to user clients self-enrolment. The App is ready for further testing on multi group users for a pilot and will need some fine tuning to suit the user requirement.

**Actions for WP T2 Deliverable 'Launch of smartphone APP':**

1. **BED, Levstone and Whysor to collect data from sensors, including developing step-by-step written procedure for collecting data from each REAMIT pilot test and sensor.**
2. **BED, Levstone and Whysor to develop guidance on managing data collected from REAMIT sensors.**
3. **Levstone to develop a web progressive APP for visualisation and data presentation.**
4. **Levstone, BED, Whysor, SenX and ITT to propose how data will be presented to end-user clients.**
5. **Levstone to propose self-enrolment APP for end-user clients.**

Several questions were raised by REAMIT partners:

Q1. What is the data size we expect to have from each pilot test?

A response to this question was provided by partners while answering question on data types.

Q2. When data will be collected?

Data may start being collected from early August 2020.

Q3. What type of data will be collected?

RR confirmed that data will be collected on temperature, humidity, VOC, lighting and shock type. At this moment, pictures or videos are not expected (but they are not excluded). Pilot tests involving Raman spectroscopy may have pictures. One option is to do processing of spectral data before sending it to cloud and the second option is to deal with it later (this should be discussed at a later stage).

RR confirmed he was in touch with technology partners for edge processing which may be also considered to save bandwidth. As of now we can predict relatively simple data for the first few pilots.

AA confirmed that data from Raman pilot test will be excel or .txt of 1 KB/spectrum. Data will have no pictures or videos. The total size of the data will be around few KB. The data base will have bigger sizes, but automatic data sent will be small.

**Action: UoN to send some examples of spectral data (completed)**

Q4. Will vehicle route data be also transmitted?

RR answered that yes; this data will also be transmitted. It will also depend on confidentiality agreements as highlighted by Picnic.

Q5. Is the common cloud platform going to be Whysor?

RR: Given the fact that Whysor will be installing all the sensors in all the pilot tests, it should be the one. RR confirmed he was not sure about the capacity of Whysor's cloud to host REAMIT data.

IH confirmed that Luke would send information regarding the above questions.

**Action: Luke from Whysor to send responses to the questions on data collected in cloud (i.e. Is the common cloud platform going to be Whysor? Will vehicle route data be also transmitted? What is the capacity of Whysor cloud to store data?)**

**Action: At the end of each pilot test, each pilot test lead will fill out a form to provide information how WP T1 is connected to WPT2. Each pilot test lead will send a completed form to BED.**

**Action: BED and technical partners will develop a template for how WP T1 is connected to WP T2.**

LM invited SM from Levstone to make presentation on the progress with implementation of WP T2.

20.41.01 SM confirmed there were three solutions of sensor architecture for REAMIT:

- External power (plug socket) – organised with gateway and sensors plugged in
- Standalone (battery) – a sensor within a box
- Sensor + mobile phone – a tiny sensor with a battery that will last for 4-5 years. It can be used with a mobile phone and will not need a router. It is a powerful option for transportation, and it is very easy because it uses the driver's phone.

The two sensors Blue Maestro Pebble and Blue Maestro Temple Disc have been tested. Temple Disc is available in Amazon retail website for about GBP 50. They have an open published interfacing protocol for communication.

The Temple disc provides pressure, temperature, dew point and humidity readings. The sensor can be accessed from 10 – 20 meters away without an obstacle and 7-8 metres with an obstacle in between. The mobile app can control the starting and stopping of sensor scanning by manually entering distance information and by selecting the required sensor. The two advantages of using the phone are the ability to access meta data (information about type of truck, type of food, temperature, pressure association with the food) and the battery life. If the sensors are put in a box, there will be loss of the accuracy of the temperature and humidity. Levstone aims to move towards the Temple disc approach and only extract useful metadata. SM showed a sample look of data on the cloud which can be accessed by clicking on the following links:

Test 1 (without readable time strings, not verbose):

[https://54.154.197.71:8440/api/query\\_WISE4220\\_signal\\_log/896742137454/0/0](https://54.154.197.71:8440/api/query_WISE4220_signal_log/896742137454/0/0)

Test 2 (with readable time strings, verbose):

[https://54.154.197.71:8440/api/query\\_WISE4220\\_signal\\_log/896742137454/0/1](https://54.154.197.71:8440/api/query_WISE4220_signal_log/896742137454/0/1)

Test 3 (24 Hours real test data)

[https://54.154.197.71:8440/api/query\\_WISE4220\\_signal\\_log/896742137454/1575427677000/1](https://54.154.197.71:8440/api/query_WISE4220_signal_log/896742137454/1575427677000/1)

Test 4 (24 Hours real test data)

[https://54.154.197.71:8440/api/query\\_WISE4220\\_signal\\_log/896742137454/1575417600000/1](https://54.154.197.71:8440/api/query_WISE4220_signal_log/896742137454/1575417600000/1)

The interface is working now. The next step (before the end of July) is to launch the first version of the app which gives the ability to connect the sensor and start to collect data. This approach could be used with Picnic and a comparison could be made with other sensors to see the temperature profiles etc.

IoT sensors may not be very reliable and directly usable. It will be good to test them, compare them for validating which sensors are more reliable.

IoT sensor standalone device with 7 Amp battery which lasts for 41 hours – 18 hours to charge, 6 hours to settle down. The concept is good but has some disadvantages: limits flexibility in changing configuration, remote configuration control will not work through mobile internet because of too many proxies, temperature reported is too high (2<sup>0</sup> C) due to self heating from components, humidity values have a heavy lag of up to 5-6 hours to drop from 75% to 45% after the sensor is brought from a cold and damp outside place to dry box. Simon highlighted the pros and cons of using Bluetooth and Wifi.

GM from I&R highlights that GPS data is sensitive to many companies which need to be considered while dealing metadata. SM says that they are only presenting different options and it is up to the stakeholder to choose which data they want to deal with.

#### **Actions:**

1. **Levstone, to launch the first version of the APP, which gives the ability to connect the sensor and start collect data.**
2. **Levstone to assist Whysor in using this approach with Picnic.**
3. **Levstone and Whysor to assist other pilot test leads use this approach for other sensors in order to make comparison to see temperature profiles.**
4. **Since IoT sensors may not be very reliable and directly usable, Levstone and Whysor to test them and compare them for validation with sensors which are more reliable.**

#### **Q&A**

Q1. Are the sensors used by Whysor compatible with the smart phone app Levstone is using or do we need to involve Levstone when procuring the sensors for each pilot test?

SM: The sensor suppliers would provide their own proprietary licensed software and may not be compatible with other sensors.

RR suggests that Simon discusses this nuances and work with Whysor to make sure that sensors from all pilot tests are compatible with the mobile app.

SM says that they are having a different solution compared to Whysor's solution. The first two options they presented use a router and the data can be sent to the cloud, while in the third one it is logged to a mobile phone. These are two different architectures.



RR says that in some cases, it may be better to transmit data through the phone and then transmit it to the cloud. The solutions provided may be good to serve the needs of the pilot scenarios. However, we need to be careful and avoid a situation that different partners come up with different solutions that are not compatible with each other at the integration stage.

MS (Whysor) addressed RR's question whether Elsys sensor has the open feature of getting connected to other environments. MS confirmed that Elsys sensor connects to the cloud using LoraWan connectivity. It is not a problem for Whysor if communication between sensors and cloud is different.

SM confirmed that Levstone aimed to have some early version enrolment in September 2020 to have a second database. Many companies (to be engaged in REAMIT pilot tests) will want to see real data before they get convinced about what the project can offer.

MS confirmed that Whysor can provide data Whysor is gathering at the moment through their API, and send it to Levstone's app. Simon suggests to have a separate conversation on the server, as it hasn't yet been collectively decided effectively to see where the data is going to reside, in what format and how it is going to be shared.

RR agreed with Simon's point about not having additional layers of data transfers.

**Action: LM (BED), MS (Whysor) and SM, DB (Levstone) to come together and make a decision on the best architecture to receive and send data to the cloud, data formatting and method of sharing with partners. The options to consider are to either use the server at BED or the reamit cloud set by Whysor and Levstone.**

RR requested that AA (UoN) sends some data to LM (BED), MS (Whysor) and SM (Levstone) to have a first look at the data. AA confirmed he held talks with MS about sending data from UoN to the cloud.

#### **Actions:**

1. **Levstone and Whysor to ensure that all sensors used for REAMIT pilot tests are compatible with the smart phone APP from Levstone.**
2. **Levstone to propose an early version of enrolment (to have a second database). This is to ensure that REAMIT partners have something to show to new companies (to be engaged in REAMIT pilot tests) i.e. to show real data so these companies can see what REAMIT can offer.**
3. **Whysor to provide data Whysor is gathering at the moment through their API and to send it to Levstone's APP.**
4. **Levstone, BED and Whysor to decide where data from sensors will reside, in what format it will reside and how it will be shared.**
5. **UoN to send some data to LM (BED), MS (Whysor) and SM (Levstone) to have a first look at the data.**

KP asked SM about the database Levstone would be building. Who will be in the database? What will be the location? From where data will be coming from (UK or all REAMIT corridors)?

SM confirmed that Levstone's database is self-enrolment database, where an organisation can self-register and enter data such as location, places, description of food types, trucks, alternative places to deliver food, sensor data, Levstone's bluetooth app data. The organisation should be able to enrol itself and load data related to food journey. The customer should be able to access this database and data.

Q2: How Levstone will reach out to the organisations that should enrol in the data base?

SM: There will be a web front end. The organisation will be able to register through this and the organisation data should be able to be accessed by the managing website.



KP suggested that it would be a task for all the partners to alert their networks about self-enrolment in the long-run.

RR confirmed that SM would be creating the web-interface and all the partners would need to participate in bringing businesses to participate in self-enrolment procedure to get more data which in turn would help them.

SM presented the idea of Bluetooth sensor-mobile app option that can be used by our consortium partners for making journeys and recording them and making this data public in multi-country context since we have people from many countries.

RR talked about charities from food companies who have a self-enrolment interface to dispose the food as closely and early as possible. The buyers also have an option to register and express interest in the products they need. Even though this solution does not use IoT data, it may be used as a concept to develop web interface in REAMIT.

Q3. To comply with BED rules, external partners may not be able to access the server itself. Is there a way where the server can be used but not access it directly to transfer data to and fro from the server?

SM confirmed that Levstone uses a general architecture for mobile devices where all the data goes through encrypted secure sockets through a port or a gateway app, so the devices do not know where the database is, so there is no login username and password. All messages go to a port and there is a program that receives the messages and access the database. For example, there is no direct access to database, all the data comes from a port. The enrolment might be directly sent to the website, while the sensor data may be transferred in the aforementioned way.

IH suggests that LM (BED) has a deeper conversation with MS (Whysor) and SM (Levstone) on the above aspects.

LM requests SM to prepare a demonstration about the trial journey idea so that all partners can execute this and generate some data.

SM says that this might be one month away as Levstone needs to tidy up the interface they have developed for this.

#### **Actions:**

1. **Levstone to provide information about Levstone's database i.e. how organisations can self-enrol, what information organisations will be required to provide, how customers can access this database.**
2. **Levstone to prepare a demonstration about the trial journey idea so that all partners can execute this and generate some data.**

LM thanked partners for their input on WP T2 and closed this WP meeting.

#### **WP T3 Business development of REAMIT technologies (Chair UU and UCD)**

20.42 SW from UCD shared a presentation of Fionnuala Murphy, with her voice recorded. With focus on reducing food waste and environmental impact of food waste, the Life Cycle Assessment (LCA) task carried out by UCD team will estimate production-phase embedded emissions of fresh vegetables and meat lost from the food supply chain. For each of the REAMIT pilot tests UCD will be providing an estimation of the environmental impact. One of the preliminary works needed to achieve this is the quantification of embedded production phase GHG emissions using Cradle-to-farm/processor-gate emission factor. The data requirements from each pilot for the LCA approach will consist of production data, transport methods and current and alternative disposal routes.

RR clarified that the main objective of the REAMIT project is to satisfy the requirement of the end-user, which may be different from the original plan. There could be a difference in the LCA method needed for each of the pilots.

SW agreed with this and assured to address the different situations based on the availability of the data. The post-doc that would be hired at UCD would be working on this and he/she would follow up on it as soon he/she joined the REAMIT team at UCD

SW apologised on behalf of Saptarishi Chakravarty who due to health issues followed by medical appointment at a hospital, could not attend REAMIT meetings on Day 2.

**Action: UCD to assist each pilot test lead in quantification of embedded production phase GHG emissions using Cradle-to farm/processor-gate emission factor.**

**Action: UCD to assist each pilot test lead in obtaining data for the LCA approach i.e. production data, transport methods and current and alternative disposal routes.**

20.43 SW confirmed UCD would host the next round of REAMIT meetings in Dublin, Ireland (January 2021). He added that hosting those meetings as physical meetings would be contingent upon the policies of the Irish government at that time. For example, the meetings will not be held physically if the situation was just like these days due to COVID-19. In this case, UCD will host REAMIT meetings online.

## **WP Management (Chair: BED)**

### *Deliverable 1.1 Project Handbook*

20.44 KP confirmed Project Handbook is systematically being updated and available on the REAMIT website (password protected section). Recent updates in the Handbook include: Calendar for 3<sup>rd</sup> REAMIT report; common errors when reporting in eMS (based on feedback from JS and second REAMIT monitoring report); how to avoid errors when reporting in eMS in the future; Interreg NWE Programme's rules on public procurement below EUR 5000.

### *Deliverable 1.2 Minutes from RAC/RWP/RSC meetings*

20.45 KP confirmed that BED drafted minutes from REAMIT meetings in January 2020 and circulate it among partners for feedback. Minutes will be reviewed during RSC meeting on Day 2.

### *Deliverable 1.3 Intermediate WP coordination*

20.46 KP confirmed that BED supported WP leads (I&R, NTU and UU) with implementation of activities under all WPs. BED actioned Dunbia (Partner) and Cottagequinn Farms LLP (Associated Partner) exit from REAMIT (following their request communicated to BED in February 2020). BED assisted WD Meats in joining REAMIT as sub-partner of UU. BED organized and chaired bi-weekly online meetings of REAMIT sub-group (composed of staff working full time on REAMIT at BED, NTU, UU) during lock-down.

### *Deliverable 2.1 Risk Log*

20.47 KP confirmed that REAMIT Risk Log has been revised and 7 new risks for REAMIT have been identified by BED based on partners' input. New risks include:

1. Delay in the implementation of running pilot tests
2. Delay in recruiting new companies for pilot tests
3. Exit of Dunbia and Cottagequinn Farms LLP from REAMIT
4. Loosing pilot tests and companies in the pipeline (i.e. since companies currently prioritize their daily business not research)
5. Lack of data from pilot tests to be sent to Big data hub for analytics
6. Delay in building Big data hub at BED
7. Delay in payments made by LP to PPs

New risks will be discussed during RSC meeting on Day 2. All partners are requested to jointly revise the REAMIT risk log.

### *Deliverable 3.1 Project reports*

20.48 KP confirmed that BED, based on inputs from partners, developed and submitted to JS REAMIT 2<sup>nd</sup> progress and finance report on 30<sup>th</sup> of March 2020. In the second claim, BED on behalf of REAMIT partnership, claimed EUR 292,018.33. Due amounts were transferred by BED to PPs in June 2020. BED is aware that payments from LP to PPs were delayed this time and such delay should be avoided in the future as it causes liquidity problems, especially for the small organisations.

**Action: BED to work on improving internal payment procedure so that delays can be avoided with transferring funds to partners.**

20.49 KP shared with partners the following information related to personnel matters:

- Una Bruhann is a new REAMIT officer at JS of Interreg NWE Programme.
- Dr Lohithaksha M. Maiyar, started his position as Research Fellow at BED in March 2020. He is responsible for coordinating WP T2 at BED i.e. he will build the Big Data hub at BED and will carry out data analytics.
- ITT has completed recruitment process of Research Assistant in Data Analytics. However, his start date has been postponed due to COVID-19.
- UCD is in the process of appointing a postdoctoral researcher to work on REAMIT. The recruitment process has been frozen due to COVID-19.
- Dr Ruth Price, a clinical trials manager at Ulster University's Coleraine campus, has joined the UU REAMIT team. She has previous experience in food research and will be assisting in coordinating future pilot tests (part-time).
- James Dooley, a Professor of Microbiology has joined the Ulster University REAMIT team, his experience in microbiology will be invaluable in assisting with the trials at WD Meats (part-time).

### **WP Long Term (Chair: BED)**

#### *Deliverable 1.2 REAMIT Networking events*

20.50 KP confirmed that the first REAMIT Symposium was organised on 9 January 2020 in Nottingham, UK. NTU coordinated organisation of the Symposium and many partners were involved in developing and delivering it. The Symposium was attended by over 50 participants from Higher Education Institutions, technological and agri-food companies, policy formation and consultancy companies. The speakers were mainly from the REAMIT project. Frans Harren from QCAP project (Interreg) and Associated Partner of REAMIT was also the speakers. Several new, valuable contacts were established during the Symposium. However, they have not been explored due to COVID-19 lock-down.

KP confirmed that the second REAMIT Symposium is scheduled on 5 November 2020 in Nantes, France. The responsible partners for this event are I&R and Valorial. More information about it will be presented in a dedicated session on Day 2.

#### *Deliverable 2.1 The agreed framework for measuring the impact of REAMIT technologies on food waste*

KP confirmed that in January 2020, BED sent out to partners the first draft of the framework. No progress has been made since.

### **WP Communication (Chair: NTU)**

SB and UR presented progress in the implementation of deliverables under WP C.

#### *Deliverable 1.1 Communication strategy*

20.51 UR confirmed that a new section was added to the Communication Strategy i.e. Events attended by REAMIT partners. List of events attended by REAMIT partners was included in section 6.1. UR requested partners to send to NTU information about external events they attended (also online events) as this information will be included in the Communication Strategy.

#### *Deliverable 2.1 Website Launch*

20.52 SB confirmed that REAMIT website has been launched in 2019 with the address [www.reamit.eu](http://www.reamit.eu). It has been systematically updated and the most recent updates include:

- Under 'News & Blogs' information about REAMIT newsletters has been uploaded (most recent newsletter from June – July 2020); information related to COVID-19 and its effect on food supply chains has been added under "REAMIT Web Articles & Online Features". Newsletter was added, the recent one being in June-July release.
- Under "EVENTS" tab information about conferences, exhibition planned/attended has been added. The Smart Food Matter conference to be held in London was postponed twice (due to COVID-19) and is expected to take place sometimes in 2021.
- 'The open challenge call' section has been changed to 'Call for participation in technology demonstrations' and deadline for recruiting companies has been prolonged until 31 December 2020.
- Recent changes (i.e. related to Dunbia's exit and WD Meats joining REAMIT) will be made shortly.
- 'Documents to share' section has been created where project internal files are stored. Partners can access this section with the password (shared with all REAMIT partners). This section contains REAMIT related presentations from RAC/RWP/RSC meetings, Communication Strategy, Project Handbook.
- Infographics has been prepared and will be displayed in the section: "BENEFITS TO STAKEHOLDERS"
- "Join REAMIT" will be a register page for actors who are interested in REAMIT project and want to participate in REAMIT activities
- Three videos have been posted in "MEDIA AND PUBLICATIONS"
- The "FUNDING OPPURTUNITIES" section has been updated with information on funding opportunities on matters related to food waste and agri-food supply chains

**Action for NTU and all partners: to reflect exit of Dunbia and WD Meats joining REAMIT project in all REAMIT communication materials i.e. to remove Dunbia from REAMIT communication materials.**

RR confirmed that the name and logo of Dunbia should be removed from all slides, brochures, posters and all communication materials.

#### **Actions:**

1. **NTU to remove name and logo of Dunbia from REAMIT website.**
2. **NTU to send to all partners the logo of WD Meats to be glued to REAMIT roll-ups in place of Dunbia's logo.**
3. **All partners to adjust their REAMIT roll-ups with the logo of WD Meats.**

SB confirmed that NTU, BED and UU have been discussing options for online storage space for larger REAMIT materials (documents, videos, pictures, etc.).

**Action for BED: to purchase cloud storage space for REAMIT.**

#### **Q&A**

20.53 SB inquired where information about the pilot tests should be published in the REAMIT website, and whether a separate tab should be created for this purpose. She asked if partners agreed to share information about all the pilot tests on the REAMIT website.

IH responded that it was a good idea to share information about pilot tests on the REAMIT website. However, it may be necessary to ask for the consent of those partners (i.e. Picnic) who preferred not to disclose the company's name in REAMIT materials.

RR supported to maintain confidentiality of private sector partners participating in REAMIT pilot tests. He suggested developing a case study for each pilot tests focusing on what it aims to achieve with respect to what the pilot tests measures, volume of food waste saved by each pilot tests (conducting initial interview and then using results from each pilot). All this information could be kept anonymous and stored under a separate tab dedicated to pilot tests on the REAMIT website.

RR suggested that the following materials can be used to showcase each REAMIT pilot test on the website:

- Pilot test architecture slide according to the template developed by BED
- The analysis made by UCD on the environmental impact of the technology solution in each pilot test

**Action: BED and pilot test leads will set deadline for collecting pilot test results. Information about the first three pilot tests can go online since we have some good information about them already:**

- **Pilot test in the NL with Picnic – End of September – IH and Picnic can be contacted**
- **Pilot test in France – end of September – AA will provide the required information**
- **Pilot test in the UK with WD Meats – WD will provide information as soon as possible**
- **Pilot test in Germany with Weyers – will need more time**
- **Pilot test in Ireland (Cyberbar) with Manor Farm (TBC) – wait till after September for this pilot information due to COVID-19**

**Action: NTU to upload information about first 3 REAMIT pilot tests on REAMIT website**

#### *Deliverable 2.2 Social media*

20.54 SB confirmed that only a few REAMIT partners were actively communicating about and promoting REAMIT in social media. Interreg NWE Joint Secretariat encouraged all organisations participating in Interreg NWE projects to actively communicate about their Interreg project in social media through their networks. It is therefore important that all partners in REAMIT increase their presence and communicate more about REAMIT in social media. For these REAMIT partners who actively promote REAMIT in social media, SB suggested to use #reamit4nwe when posting on Twitter, LinkedIn or Facebook. In this way the communication team at NTU can be notified about the communication activity.

**Action: All individual partners are requested to share with SB personal or professional social media details, whichever they use to communicate about REAMIT activities. Based on partners' input, Sasha will develop a database.**

**Action: Sasha to publish the social media database (password protected) of REAMIT partners in the REAMIT website.**

**Action: All partners are requested to send updates to NTU about their efforts to communicate about REAMIT in social media.**

#### *Deliverable 3.1 Project banners, posters and flyers*

20.55 SB confirmed that all REAMIT documents and promotional materials need to be updated to reflect exit of Dunbia and entry of WD Meats. A new promotional material has been developed to be installed on trucks during pilots. These are A2 size vehicle magnets in the form of magnetic posters.

#### *Deliverable 4.1 Reports on networking events*

20.56 UR confirmed that the first networking event (first REAMIT symposium) was organised by NTU with support from partners on 9 January 2020 in Nottingham, UK. NTU have drafted a report from the first REAMIT Symposium.

### *Deliverable 5.1 Journal Articles*

20.57 UR confirmed that NTU is developing a report on COVID-19 and its impact on food supply chains. Some elements of this report have been published in the REAMIT newsletter (contributions from Sasha, Usha and Lohit). UR asked all REAMIT partners to contribute with updates to improve the COVID-19 report, as the report aims to cover the impact of COVID-19 not only on the REAMIT project but also on the wider agri-food sector. This report will be published on the REAMIT website in the next months.

Action: Each partner to send updates to NTU on impact of COVID-19 not only on the REAMIT project but also on food supply chain (beyond REAMIT) seen and/or experienced from their own organisation's perspective.

Action for NTU: Advance the report on COVID-19 and its impact on food supply chain and publish it on the REAMIT website.

20.58 UR confirmed that REAMIT newsletters are published every 3 months.

20.59.01 UR confirmed that BED is leading the work on a sensor review paper. In order to collect data for the paper, LM (BED) and WD (UU) conducted interviews with 2 different companies. The sensor review paper is an extension work of a conference paper which was presented by RR at Euroma conference. The sensor review paper aims to collect tacit knowledge of sensors available in market.

20.59.02 UR observed that partners made their own efforts to write papers focusing on agri-food supply chains. At the end of the REAMIT project, all publications developed by REAMIT partners building on and related to the REAMIT project, will need to be quoted as REAMIT outcomes. UR suggested discussing this at the next round of REAMIT meetings in January 2021 to clarify requirements and agree on a shared approach.

20.59.03 RR supported UR's suggestion and asked all partners for regular updates and information on their progress on writing REAMIT inspired journal articles. Updates from partners will be used by NTU as input when communicating about REAMIT inspired publications developed by REAMIT partners. At the moment it seemed that mostly UK teams developed REAMIT inspired publications.

### *Infographics*

20.60 SB presented infographics on 'Benefits from participation in REAMIT pilot tests'. She asked for feedback and ideas from partners about possible changes and improvements of infographics. The following suggestions were made on how to improve the infographics:

- the representative numbers on the infographics would be changed to icons
- the number of words in the paragraphs would be reduced and replaced by shorter phrases – in this way the infographics would be easily readable
- use of icons is important and strengthens the visibility of information communicate in the infographics
- including all circles in one page would improve reader-friendliness of infographics and
- consider using slogans to reduce a number of words
- RR confirmed a second version with small bullet points and customer satisfaction as the main bullet point. A pdf document with 12 bullet points would be the main infographic, while the reader should be able to access more information when they click on the infographic symbols through hyperlinks.
- Originally, the infographics was titled 'benefits for food producer and transportation companies from participation in REAMIT pilot tests'. Consider using the original title for the infographics.

**Action: NTU to finalise the infographics and publish it on the REAMIT website.**

**Action: NTU to consider printing hard copies of infographics as REAMIT promotional materials.**

The new REAMIT video

20.61.01 SB presented the new REAMIT video. She asked partners for ideas how it can be improved. The following comments were made by REAMIT partners:

- (SM from Levstone) Promote better typology of REAMIT partners, and in particular the academic institutions involved in the REAMIT project, to emphasize that there is real knowledge behind the project and the REAMIT consortium has some heavy weight players. RR agreed with SM and suggested to highlight the multi-disciplinary expertise blended in the REAMIT project.
- ShB agreed to the suggestions made by SM and suggested to reduce the speed of the video. This would make the video more comprehensive.
- IH agreed and confirmed text changed too fast in the video and the narrator should be a native English speaker.
- SM suggested that this video was perfect for Instagram, and other social media.
- YD (BED) inquired if a company was interested in joining, how could they join REAMIT pilot tests.

**Action: NTU to create links for guiding interested parties to register on the REAMIT website their interest in REAMIT (pilot tests, technology, etc.)**

20.61.02 RR clarified that the REAMIT project focussed on both research and commercialisation. He suggested that SB got in touch with ShB to improve REAMIT videos and infographics with ShB's help.

**Action: NTU to work with ShB to improve REAMIT videos and infographics.**

**REAMIT Steering Committee meeting (attended by all REAMIT partners), Chair BED**

To begin with, Ram congratulated JC (UU) for being promoted to Professor at Ulster University.

The following partner organisations were represented at the RSC meeting.

Partner organisation	Representative presence
BED	YES
I&R	YES
UCD	NO
ITT	YES
UoN	YES
Levstone	YES
NTU	YES
Whysor	YES
SenX	YES
UU	YES

KP confirmed that the following 7 items would be discussed during RSC meeting:



1. Confirmation of minutes from RSC meeting on 15 – 16 January 2020 in Rennes, France.
2. Advice from RAC and decisions on WPs meetings will be discussed and approved after discussion.
3. Impact of COVID-19 on REAMIT and deviations from the original plan highlighted by partners.
4. REAMIT Risk log
5. Second REAMIT activity and financial report – feedback from JS
6. Third REAMIT activity and finance report – calendar
7. Data for next RAC/RWP/RSC meetings

Item 1. Confirmation of minutes from RSC meeting on 15 – 16 January 2020 in Rennes, France.

20.62.01 KP scrolls through page by page of draft minutes from RSC in January 2020.

20.61.02 RR suggested that NTU can use ideas generated during the elevator pitch to develop the infographics. ShB suggested that the elevator pitch could also be used for the REAMIT video she created recently.

RR suggested that REAMIT infographics and videos would be very useful to present at external meetings and events attended by REAMIT partners.

20.62.03 No other comments were shared and the minutes from RSC in January 2020 were considered as accepted.

Action log discussed at RSC meeting in January 2020 was reviewed.

20.63.01 REAMIT roll-up done by I&R, Whysor, BED, NTU, UU. ITT is doing it and will attach it in their report to be submitted to eMS by September 2020. UCD have not done it and will need to be followed up. SenX added a photo in eMS but will check and confirm. Levstone has printed a roll up but they are not sure whether they uploaded it in eMS.

20.63.02 RR clarified that the picture of a roll-up should be taken in the premises of the partner's organisation as it is important to show that a picture of a real roll-up is taken, rather than send a picture of a roll-up in pdf or other formats. UU will take a picture of their roll-up once the campus opens and they will include it in eMS report.

**Action: BED to check with Una at JS whether the rolls ups have to be redesigned following Dunbia's exit and WD Meats joining REAMIT.**

**Action: All partners to take a picture of their roll-ups inside their office with their roll-up banner unfolded and send it to BED and NTU.**

**Action: All partners to send details to NTU about their 5 communicating actions made each semester, including information on what was communicated and when it was communicated, and what is important for each partner organisation to communicate about with regards to REAMIT.**

20.63.03 IH confirmed that Whysor communicated 5 times in social media about REAMIT.

GC confirmed that ITT has made communications a couple of times through his personal email and shared the social media account details with SB. He also retweeted some posts as he spoke.

FT confirmed SenX communicated about REAMIT in social media. He would send precise information if necessary.

GM confirmed I&R and Valorial communicated about the second REAMIT Symposium but did not yet achieve 5 communication activities.

SM confirmed he needed help. He asked SB to help Levstone communicate effectively in social media.



KP suggested that SB arranged an online meeting on how to communicate about REAMIT through social media. The meeting would be open to all partners.

UU communicated about REAMIT through various channels. WD offered to send details to BED and NTU.

**Action: NTU to arrange a brief online training on how to communicate about REAMIT through social media.**

**Action: NTU to finalise the infographics based on partners' input.**

**Action: NTU to engage partners to help translate the infographics to French, German and Dutch.**

SM suggested that infographics would need to be updated systematically.

RR agreed.

20.64 KP reviewed with partners other actions in action log:

RR confirmed the action "Pilot test leads to use pilot test template to report update on the pilot test at the next REAMIT meeting" will be marked as "ongoing", not as "completed", since the work on pilot tests is ongoing.

RR said the action "To start looking for another pilot test. NTU to provide more details of the new pilot test in England" would be marked "ongoing", as this work is ongoing.

UR agreed.

WD approved that action "UU to check if Levstone can install their sensor in Dunbia trucks to assess quality of data collected" would be marked as "not applicable" and a new action would be created in relation to WD Meats and it would be marked as "ongoing".

UU approved the action "UU to try to send data from sensors to REAMIT analytics partners" would be marked as "ongoing".

BED approves that the action "BED to develop a template of Confidentiality Agreement ready to be used by partners who need to sign it with the end user company participating in the pilot test" is "ongoing". If any pilot test has any urgent requirement, BED will take it up as a priority issue.

WD confirmed the template UU used for REAMIT was generic which they have used for other projects and modified it for WD Meats.

**Action: BED to prepare a confidentiality agreement template similar to the one prepared by UU for WD Meats.**

20.65 No inputs given by partners on the amount of budget allocated for partners for sensors.

Ram clarified that partners should inform well in advance the pilot test lead and BED about their intention to purchase sensors. BED can purchase sensors for partners who asked for it in the Application Form, rather than reimburse the cost of sensors to the partner. Since BED needs to follow strict public procurement rules and requirements, partners who need sensors, need to communicate about it with BED as early as possible.

20.66 BED approves that Ram's visit to German and Dutch pilot tests is marked as completed (visit cancelled due to COVID-19) and will take it up as new action when BED reopens.

20.67 ITT agrees that the action "ITT to check whether a new Irish pilot test would be possible with the Freshbox idea" is "ongoing". That is because companies have stopped responding to UCD due to COVID-19. UCD is now looking into engaging with existing companies for the Cyberbar pilot test, as recruiting new companies is challenging.

**Action: GC at ITT to consider possibilities of a new Irish pilot test with Freshbox technology**

20.68 IH (Whysor) agreed that the action “UoN to collaborate with Whysor to develop the cloud system for Pilot Test carried out by UoN” is ongoing. AA (UoN) and MS (Whysor) have had talks to achieve this.

20.69 Whysor, UU, and UoN approved the action “Whysor, UU and UoN to provide photos representing their pilot tests. Photos to be sent to NTU and BED to be used in REAMIT promotional materials” as “ongoing”.

**Action: Whysor to take pictures of the pilot test with Picnic and send them to NTU.**

**Action: UU to take pictures of pilot test with WD Meats and send them to NTU.**

**Action: UoN to take pictures of Raman equipment and send them to NTU.**

**Action: Pilot test leads to make videos of their pilot tests and send them to NTU.**

Levstone agrees that the action: “Levstone to update progress on the second self-enrolling database and their efforts on data security in REAMIT; and help create a general data governance system for REAMIT” is marked as “ongoing”.

Levstone approves the action “Levstone to provide detailed technical description of Pebble and discuss about using it in pilot tests with pilot test leads and Whysor” to be marked as “ongoing”. They are two weeks away from conducting final trials. Kate says there will be discussion with Lohit on these.

All approved that “All technology partners to test the reliability of their systems before installation in REAMIT” is “ongoing”.

Ram suggested that the action “All partners to make at least 5 communication actions about REAMIT each semester, among this at least one tweet” is duplicating with the earlier one with the same goals and this should be linked with the earlier one.

**20.70 Action: BED to ask JS whether including REAMIT logo in email signature is compulsory.**

BED approves that the action “All partners to send their ideas for the second REAMIT symposium to the organisers (I&R and Valorial), NTU and BED” to be marked as “completed” because of discussions going to be made in the afternoon session regarding this.

BED approves that the action “All partners to send their feedback on the REAMIT Measurement Framework” as “ongoing” given that UCD’s framework is going to be dependent on progress on pilots which is currently ongoing.

BED approves that the action “Every partner to identify their target groups and communicate directly to their groups at least five times during REAMIT project lifetime” is “ongoing”.

BED approves that the action “All partners to contribute to the Sensors Review continuously, specifically for the table of best sensors for a given combination of chillness of food, kind of perishable product and specific part of the supply chain” is “ongoing”.

BED approves “NTU to consider preparing a short video highlighting the benefits to food producer and food transporter companies.” as ongoing.

BED approves the action “BED to coordinate development of data management plan for REAMIT” is “ongoing”.

Lunch break

Item 2 – Advice from RAC and decisions on WPs meetings will be discussed and approved after discussion.

And Item 3 – Impact of COVID-19 on REAMIT and deviations from the original plan highlighted by partners.

20.71.01 KP provided feedback from the REAMIT Associated Partner – East Netherlands Agency. They said it was not clear in the REAMIT report why BED asked for a 12-month project extension. KP confirmed that a request for 12-month

extension of the REAMIT project was a result of two categories of risks identified in the REAMIT project due to COVID-19. Category 1 risk and category 2 risk. Category 1 risk were delays in the implementation of REAMIT pilot tests due to COVID-19, as partners and sub-partners were unable to proceed with pilot test activities (i.e. due to lock-down, partners were unable to attend premises of the companies participating in pilot tests). This caused a delay in the implementation of pilot tests of about 4-6 months. Delays in the implementation of pilot tests had negative impact on the remaining WPs and might create additional delays of approximately 6 months. Hence, BED indicated an overall delay of the project amounting to 12 months. Consequently, BED asked JS for a 12-month project extension. KP confirmed that BED requested only extension of time, not budget. Once this request was approved by JS, BED and partners would assess whether they needed extension of the budget. REAMIT partnership might then consider asking JS for financial extension of the REAMIT project.

**ACTION: BED to ask JS when to expect an answer about extension of the REAMIT project.**

#### Item 4 – REAMIT Risk log

20.72.01 KP invited partners to jointly revise the REAMIT risk log. She confirmed that the risk log was a compulsory document for the REAMIT project and needed to be revised systematically and jointly by the REAMIT partnership. Based on reports from partners (for the reporting period January – June 2020), BED has identified 7 new risks for the REAMIT project:

1. Exit of Dunbia from the REAMIT consortium: Partners at UU have been very engaged in developing the pilot test with Dunbia and have invested in this much resources. Now, with Dunbia exiting the REAMIT project, UU partners have to start these efforts from scratch (i.e. they need to find a new meat producer company and engage with them for the pilot test, understand the needs of the new company and based on it identify the focus of the new pilot test, enrol the new company in the REAMIT project as associated partner or sub-partner and develop the necessary paper work, etc.).

The following risks have been caused by COVID-19:

2. Delays in the implementation of pilot tests
3. Delays in recruiting new companies for pilot tests
4. Loosing pilot tests and companies in the pipeline
5. Lack of data to be analysed in the Big Data Hub
6. Delay in payments made by LP to PPs
7. Delay in building the Big Data Hub at BED

20.72.02 GC (ITT) suggested adding another risk 'recruitment of personnel'. In particular, COVID-19 followed by lock-down caused delays in the recruitment of new staff at ITT (i.e. visa application has been put on hold, selected candidate could not travel to Ireland, signing his contract and his start date at ITT have been postponed until after COVID-19).

RR asked if other partners had similar difficulties with recruitment.

KP advised that UCD also experienced a delay in recruitment a full-time staff member dedicated to REAMIT.

20.72.03 SM suggested another potential risk for REAMIT i.e. that some companies were not producing or distributing sensors from suppliers which caused delays. Both Levstone and Whysor experienced this problem in the past months.

IH advised it was mainly production and delivery of sensors. SM said that some suppliers did not currently make or sell new sensors. There was no stock of sensors in the EU and some companies needed to ship equipment from USA. This has had impact on WP T1.

20.72.04 KP asked partners for input on various risks:

Risk 1 – Exit of Dunbia from REAMIT consortium

Ownership of risk – BED and UU

Impact on WP T2, WP T3, WP LT

Actions taken to minimise impact of this risk on REAMIT: UU approached WD Meats and WD Meats are now a sub-partner of UU in REAMIT project.

Risk 2 – Delays in the implementation of pilot tests

Ownership of risk – BED, UU, UoN, I&R, UCD

Impact on WP T2, WP T3, WP LT

Actions taken to minimise impact of this risk on REAMIT: partners gently approach partner companies involved in pilot tests, partners look for new pilot tests, BED asked JS for 12-month project extension.

Risk 3 – Delay in recruiting new companies for pilot tests.

RR suggested that partners still approach new companies but do not push too much.

Risk 4 – Losing pilot tests and companies in the pipeline

To address this risk and deliver what has been promised in the REAMIT AF, BED requested a 12-month project extension.

Risk 5 – Lack of data from pilot tests to be sent to Big Data Hub at BED:

Since there is no data from pilot tests, data analytics cannot be done, and prototypes of technology cannot be built. Partners will continue to work towards resuming pilot tests and getting data from pilot tests.

Risk 6 – Delay in payments made by LP to PPs.

SM said that this delay at BED caused some liquidity issues for Levstone.

RR confirmed he would work with finance team at BED to reduce delays in the payment process from BED to project partners.

Risk 7 – Recruitment of staff for REAMIT

Any further delays in recruiting staff could impact capability of REAMIT data analytics partners to perform data analytics.

GC from ITT said that if there were further delays with recruiting new staff at ITT, ITT current staff would do some data analytics for REAMIT (staff currently working at IMAR at ITT), even though some budget was allocated to ITT in REAMIT project to employ new staff to do data analytics.

Risk 8 – No sensor equipment in stock

SM said that if there was no equipment in stock, SM would discuss with RR possibilities of obtaining other, suitable sensors.

#### Item 5 – Second REAMIT activity and financial report – feedback from JS

20.73 KP confirmed there were several comments from JS that REAMIT partners would need to consider improving quality of reporting in eMS in the future:

- Some REAMIT partners need to improve reporting of costs in eMS. In particular, partners cannot bundle up cost items and need to report every cost item (every invoice and every pay slip) as an individual entry. KP confirmed that BED has contacted the partners concerned and explained them how to avoid this kind of error in future reporting rounds.

- REAMIT partners need to improve reporting on reaching out to target groups. Partners confirmed that it was difficult over the last 6 months to reach out to the listed target groups due to COVID-19 and lockdown. Partners confirmed they would keep trying contacting REAMIT target groups in the next 6 months.

#### Item 6 – Third REAMIT activity and finance report – calendar

20.74 KP confirmed that partners would need to submit to BED by 7 August 2020 their certified financial and progress reports and payment claims. Partners agreed.

#### Item 7 – Date for next RAC/RWP/RSC meetings

20.75 Partners agreed that the next round of RAC/RWP/RSC meetings will take place on 20 – 21 January 2021 in Dublin, Ireland. These meetings will be hosted by UCD.

#### *End of REAMIT Steering Committee Meeting*

KP confirmed there were two more important sessions planned for the second day of the REAMIT meetings: ‘Presentation on the second REAMIT Symposium’ facilitated by Valorial and a final session on ‘Other points to discussed’ facilitated by BED.

KP invited BF from Valorial to present the preparatory work on the second REAMIT Symposium.

#### Presentation on the Second REAMIT Symposium, on 5 November 2020, Nantes, France

20.76.01 BF, Innovation Project Manager at Valorial made a presentation on the planned second REAMIT Symposium. BL introduced Valorial and confirmed that its mission was to help agri-food businesses to innovate. Valorial had 360 members spread across different clusters. BF confirmed they expected 200 attendees at the REAMIT Symposium, of which 100 would be Valorial members, 30 persons would be leaders at Valorial, and 70 persons would be international guests and attendees (including REAMIT partners and actors from their networks).

BF confirmed the objectives of the Symposium were i) to disseminate information about REAMIT project and its results; and ii) to raise awareness about food waste and actions to address food waste.

BF confirmed there would be a possibility to have B2B meetings in separate rooms in the venue of the Symposium. Simultaneous translation service would be provided (French to English and vice versa).

BF shared an advanced draft agenda of the Symposium agenda, with a variety of speakers and presentations on REAMIT pilot tests.

The proposed agenda had four parts:

- introduction and a guest speaker – the French policy officer at the European Commission
- REAMIT presentations of pilot tests
- Testimonials and solutions
- B2B Meetings

BF confirmed that on the day before the Symposium (i.e. on 4 November 2020), I&R would arrange on-site visits to some local agri-food companies (exploratory mission). More details about on-site visits would be available together with finalised agenda and invitation to the Symposium, that are planned in September. BF also confirmed that at the end of the Symposium there would be opportunity for everyone to network.

20.76.02 BF confirmed that the main challenges Valorial and I&R faced with the organisation of the Symposium was attracting international guests. For this reason, Valorial and I&R considered covering travel and accommodation costs of some international participants (4-5 persons). RR suggested it would be possible to accommodate this additional cost.

Valorial and I&R would need to carefully consider with BED the budget necessary to cover the costs attendance of some international guests.

20.76.03 ShB suggested a panel discussion during the Symposium (UR said this might be too ambitious to achieve during a 1-day session), possibly including guests from other Interreg projects.

20.76.04 In the next days, Valorial would be sharing 'save the date' post about the Symposium, that all partners were requested to share through their social media.

20.76.05 BF confirmed that Valorial and I&R considered that second wave of COVID-19 foreseen in autumn 2020 would be a major risk for the second REAMIT Symposium. In current circumstances, Valorial and I&R needed to plan the event as normal and would re-assess the situation in September 2020.

SM mentioned Valorial and I&R should consider the possibility of turning this event into a webinar. GM advised against this as numbers of attendees would drop and Valorial and I&R would not meet their targets.

GM would rework the agenda with BF and would contact partners to share an updated agenda.

20.76.06 RR suggested that to attract more international attendees, BED could invite UK speakers and other international guests (from BED's network), if the agenda had flexibility to accommodate new speakers.

*15-min coffee break*

#### European Green Deal

20.77 RR presented the EU Green Deal funding. This EU funding source under Horizon 2020 would fund projects in the EU which were climate neutral. UK would still be eligible to apply as a lead partner. The call will be about transformative change. There will be a call for funding in September 2020 with the budget of about £1bn. The call will be about transformative change and new technologies which are very similar and in line with the focus of Interreg's calls. RR confirmed there were 8 principal areas, and Area 6 'From farm to fork' is relevant and close to REAMIT. Other principle areas such as ecosystem and biodiversity, increasing climate ambition also seem similar to Interreg thematic priorities. RR encouraged partners to keep an eye on this and similar funding opportunities. RR invited interested partners to get in touch with him. He presented more details about European Green Deal in his slides.

**Action: RR to keep partners informed about the Green Deal funding.**

#### COVID-19 related funding opportunities

20.78 RR confirmed there were 2 new funding opportunities related to COVID-19 and he encouraged partners to get in touch with him if they were interested.

#### Articles and papers

20.79.01 LM confirmed the following research papers have been written (or are in progress) by REAMIT partners:

- At EurOMA conference in April 2020 RR presented the conference paper "A review of sensors for reducing waste in food logistics and supply chains"
- WD (UU) and LM (BED) were conducting interviews to develop the white paper on sensors (in cooperation with Levstone)
- BED has been writing a paper on OR modelling: 'Wastage aware rapid response model for transport of fresh agri-food products'.
- UU has written a journal paper on sensor technology: 'Sensing technologies for maximizing quality and minimizing waste of meat', submitted to JCP, May 2020.

- UoN has written papers on Raman Spectroscopy

20.79.02 LM presented the EurOMA Conference paper. He said that the paper considers three types of sensor technologies focusing on temperature, humidity and light intensity. The paper includes a questionnaire which explores choosing different sensors for the appropriate food types and measurements. BED and UU would be interviewing sensor companies; they have also interviewed two of REAMIT technology partners – Whysor and Levstone who were asked about their preferences of sensor types and usage. LM explored scenario with Picnic as an example. He looked at the transportation journey and challenges (inspired by the grocery supply chain). BED and UU will now come up with a framework which looks at delivery times, wastage thresholds, degradation levels of food, location costs, and other variables.

RR suggested that partners approached LM to discuss further ideas for the paper outside REAMIT online meetings.

**Action: Partners interested in contributing to EurOMA paper, to contact Lohit directly outside REAMIT online meetings.**

**Action: LM to champion preparing more research articles.**

20.72.03 WD from UU presented 'Sensor technologies for maximizing quality and minimizing waste of meat' journal paper on sensors submitted to JCP, May 2020. In that paper UU looked at meat quality decreasing due to animal stress. UU suggested that better animal welfare management would result in better nutrition and reduced food waste. UU also looked at how changing temperature conditions during logistics (drop of temperature inside a fridge in a lorry) affects food quality (i.e. since changing conditions facilitate occurrence of dark cutter beef). When cattle go into market to be sold, separating them from other animals, makes them stunned and stressed, which results in the dark cutter meat.

WD suggested to tackle this by using different IOT sensors such as body temperature sensors, sensors to monitor animal movements to detect stress, 'electronic' noses sensors to find out why the meat is decreasing in quality so quickly. The paper explores a variety of sensors that would be most suitable for this type of study. UU is currently waiting for feedback to proceed with this work.

RR mentioned that this paper was initially inspired by the issue that Dunbia was facing.

SB suggested this could be further explored with WD meats.

FM and WD have agreed this will be done.

20.73 RR confirmed that the online meeting related to the Capitalisation Call from Interreg NWE Programme would take place on 5 November 2020 (which is the same date as the second REAMIT Symposium).

RR thanked everyone for attending REAMIT meetings and closed the meeting.

*End of the meeting*

**Matters Arising and Actions from RSC online meeting on 8-9 July 2020**

Date	Minute/ Item	Action <i>identified</i>	Responsibility	Update: <i>Confirmation of completion or reasons for non- completion</i>
200708	20.23.03	UoN and I&R to send third REAMIT progress report to their associated partners and ask for feedback.	UoN and I&R	UoN completed I&R ongoing
		<b>WP T1 – Actions</b>		
200708	20.28.13	<b>Actions for pilot test with Picnic</b>  BED to finalise purchase of 20 EMS sensors and 20 batteries from Elsys.	BED	Completed
200708	20.28.13	Whysor to do configuration of sensors.	Whysor	Completed
200708	20.28.13	Whysor to install 20 sensors in the Picnic's truck.	Whysor	Planned for January 2021
200708	20.28.13	Whysor to connect 20 sensors and arrange for transmission of data from sensors using KPN LoRaWAN (which has coverage in the entire Netherlands) to the online Whysor cloud.	Whysor	Planned for January 2021
200708	20.28.13	Whysor, BED, Levstone to arrange for data to be transferred from Whysor cloud to Big Data server at BED.	Whysor, BED and Levstone	Planned for January 2021
200708	20.28.13	Whysor and BED to decide whether it is wise to set alerts now (with the help of a functionality called complex event processor available in the Whysor cloud to generate alerts based on temperature thresholds or	Whysor and BED	Planned for Q1 2021



		acceleration thresholds. These alerts are meant to generate new information for the pilot test partner – Picnic.		
200708	20.28.13	Whysor, BED and Picnic to develop a system to generate alerts for Picnic.	Whysor, BED and Picnic	Ongoing
200708	20.28.13	Whysor and BED (with assistance from ITT and SenX) to integrate data obtained from sensors with data in warehouse of Picnic.	Whysor, BED, ITT and SenX	Ongoing
200708	20.28.13	BED (with assistance from Whysor, ITT and SenX) to separate the data into tables for analysis.	BED, Whysor, ITT and SenX	Ongoing
200708	20.29	<b>Actions for pilot test with Weyers</b> Whysor to re-establish contact with Weyers to check if they are still interested in REAMIT project.	Whysor	Completed
200708	20.29	Whysor to install VOC and GPS sensors provided by REAMIT in Weyers trucks.	Whysor	It was planned for December 2020, but is not completed yet due to lack of response from Weyers.
200708	20.29	Whysor and BED to arrange for receipt of data from sensors and transport of data to the reamit.whysor cloud.	Whysor and BED	Ongoing
200708	20.29	Whysor to arrange collection of data from sensors on VOC, Co2, temperature, pressure, Lux, weather conditions and employees' inputs.	Whysor	On hold now to be progressed
200708	20.29	Whysor to arrange the connection to the cloud through a gateway.	Whysor	Completed

200708	20.30.05	<b>Actions for pilot test with WD Meats (Clostridium bacteria)</b>  As soon as it is possible (due to COVID-19 lockdown restrictions) UU to access the sites of WD Meats to determine where to install the sensors.	UU	UU accessed the sites of UU in August-2020 and since then WD Meats have been locked down again. Ongoing
200708	20.30.05	UU to carry out PCR analysis on meat samples from WD Meats in the laboratory of UU (this will be a temporary solution to determine the method to detect the bacteria.	UU	Ongoing
200708	20.30.05	UU to identify an alternative sensor and sensor supplier to the one promised by Mathias from Freshdetect.	UU	Ongoing
200708	20.30.05	UU to determine the right sensing equipment that can help detect Clostridium bacteria without the laboratory testing i.e. in ambient environment on the sites of WD Meats while the meat is still on the conveyor belts.	UU	Ongoing with support from MU and Sensipdx
200708	20.30.05	UU to use the sensing equipment to detect Clostridium bacteria on the sites of WD Meats.	UU	Ongoing
200708	20.30.05	UU to pursue with WD Meats and transport company Blairs for a transport pilot.	UU	Ongoing
200708	20.31.05	<b>Actions for pilot test with WD Meats (Dry aging chamber)</b>  Once WD Meats opens up again, UU to access the sites of WD Meats to assess	UU	Ongoing

		where to install sensors in a dry aging chamber.		
200708	20.31.05	UU to work with Whysor and Levstone on choosing the right sensors suitable for fitting inside WD Meats's dry aging chamber.	UU, Whysor, Levstone	Complete
200708	20.31.05	UU to purchase sensors suggested by Whysor.	UU	Complete
200708	20.31.05	WD Meats to facilitate installation of sensors by UU	WD Meats	Ongoing
200708	20.31.05	UU to install sensors in dry aging chamber.	UU	Ongoing
200708	20.32.03	<b>Actions for the 3D Fluorescence pilot test</b>  UU to action procurement of two 3D Fluorescence sensors from Matthias Heiden from FreshDetect.	UU	Complete
200708	20.32.03	In parallel, UU to explore other possibilities of procuring 3D Fluorescence sensors from the following companies: Chelsea Technology (German company suggested by TA), Flurotech (company in the UK suggested by TA) and German tech company (suggested by TA).	UU	Chelsea Ongoing
200708	20.32.03	UU to develop a document listing pros and cons of 3D Fluorescence sensors offered by each of the companies: FreshDetect, Chelsea Technology, Flurotech and German technology company.	UU	Ongoing
200708	20.32.03	UU to investigate whether the company selected to provide 3D Fluorescence sensors	UU	Ongoing

		for pilot test with WD Meats is keen to commercialise their technology by acquiring patents. If yes, UU to develop a list of steps necessary in the process of patent acquisition.		
200708	20.33	<b>Actions for the pilot test at UoN with Raman Spectroscopy</b>  UoN to complete purchase of all elements of Raman spectrometer.	UoN	Completed
200708	20.33	UoN to start the first round of measurements with Routhiu to test Raman set-up.	UoN	Completed
200708	20.33	Whysor and SenX, to support UoN with transmission of data from Raman sensor to REAMIT cloud.	Whysor, SenX and UoN	Ongoing with input from BED
200708	20.33	UoN to agree with Whysor frequency of data transmission from sensor to REAMIT cloud	UoN and Whysor	Ongoing with input from BED (60 min)
200708	20.33	BED and Whysor to help UoN with data transmission from sensor to cloud.	BED, Whysor and UoN	Ongoing
200708	20.34.02	UCD to send LP an update of the situation with developing cyberbar pilot test.	UCD	Completed
200708	20.35	<b>Actions related to developing new pilot tests</b>  UoN and I&R to confirm whether BbaMV (milk and dairy products consortium) will participate in developing a new pilot test in REAMIT.	UoN and I&R	Completed

200708	20.35	UoN and I&R to confirm whether IGRECA (egg producer in France) will participate in developing a new pilot test in REAMIT.	UoN and I&R	Completed
200708	20.35	UoN to confirm whether sea-food producer company will participate in developing a new pilot test in REAMIT using Raman spectroscopy.	UoN	Ongoing
200708	20.35	UoN to confirm whether one partner from Adria consortium will test one batch of sample with Raman spectroscopy (and if they find the results positive, whether they will engage in a full pilot).	UoN	Completed To be considered as a separate pilot on egg product
200708	20.35	Whysor to approach Meyer QLS to find out if Meyer QLS will participate in the REAMIT pilot test.	Whysor	Completed
200708	20.35	NTU to approach Tesco to find out if Tesco will participate in the REAMIT pilot test.	NTU	Completed
200708	20.35	NTU to approach Pepsi to find out if Pepsi will participate in the REAMIT pilot test.	NTU	Completed
200708	20.35	NTU to approach smaller consortia in NTU's networks and projects to find out if they will participate in REAMIT pilot tests.	NTU	Completed
200708	20.35	BED to approach METRO through Tsenso to find out if METRO will participate in REAMIT pilot test.	BED	Ongoing
200708	20.37	BED to work with ITT for suitable collaboration opportunities in aquaculture, outside of REAMIT.	BED	Ongoing

200709	20.38.03	<b>WP T2 – Actions</b>  REAMIT sub-team (BED, Whysor, SenX, Levstone, ITT) to develop a scenario enabling the REAMIT cloud to receive and manage other types of data received from all pilot tests (not only data on temperature, humidity and VOC).	BED, Whysor, SenX, Levstone, ITT	Ongoing
200709	20.38.03	Levstone to work with Whysor in using Levstone's new platform for REAMIT.	Levstone	Ongoing
200709	20.39	BED to finalise purchase of equipment to build the Big Data hub at BED.	BED	Completed
200709	20.39	BED to finalise purchase of software necessary for the Big Data hub at BED.	BED	Completed
200709	20.39	BED (with the help of ICT at BED) to prepare a room at BED (Luton campus) where the Big Data hub will be mounted.	BED	Completed
200709	20.39	With the help of equipment supplier, BED to finalise building up of the Big Data hub, including installation of software.	BED	Completed
200709	20.40	BED, Levstone and Whysor to collect data from sensors, including developing step-by-step written procedure for collecting data from each REAMIT pilot test and sensor.	BED, Levstone and Whysor	Ongoing

200709	20.40	BED, Levstone and Whysor to develop guidance on managing data collected from REAMIT sensors.	BED, Levstone and Whysor	Ongoing
200709	20.40	Levstone to develop a web progressive APP for visualisation and data presentation.	Levstone	Ongoing
200709	20.40	Levstone, BED, Whysor, SenX and ITT to propose how data will be presented to end-user clients.	Levstone, BED, Whysor, SenX and ITT	Ongoing
200709	20.40	Levstone to propose self-enrolment APP for end-user clients.	Levstone	Ongoing
200709	20.40	Whysor to send responses to the questions on data collected in cloud (i.e. Is the common cloud platform going to be Whysor? Will vehicle route data be also transmitted? What is the capacity of Whysor cloud to store data?	Whysor	To be linked to BED server
200709	20.40	BED and technical partners to develop a template for how WP T1 is connected to WP T2.	BED, Whysor, Levstone.	Ongoing
200709	20.41.01	Levstone, to launch the first version of the APP, which gives the ability to connect the sensor and start collect data.  Levstone to assist Whysor in using this approach with Picnic.  Levstone and Whysor to assist other pilot test leads use this approach for other	Levstone	Ongoing

		sensors in order to make comparison to see temperature profiles.		
200709	20.41.01	BED, Whysor and Levstone to come together and make a decision on the best architecture to receive and send data to the cloud, data formatting and method of sharing with partners. The options to consider are to either use the server at BED or the reamit cloud set by Whysor and Levstone.	BED, Levstone and Whysor	Ongoing
200709	20.41.01	Levstone and Whysor to ensure that all sensors used for REAMIT pilot tests are compatible with the smart phone APP from Levstone.	Levstone and Whysor	Ongoing
200709	20.41.01	Levstone to propose an early version of enrolment (to have a second database). This is to ensure that REAMIT partners have something to show to new companies (to be engaged in REAMIT pilot tests) i.e. to show real data so these companies can see what REAMIT can offer.	Levstone	Ongoing
200709	20.41.01	Whysor to provide data Whysor is gathering at the moment through their API and to send it to Levstone's APP.	Whysor	Ongoing
200709	20.41.01	Levstone, BED and Whysor to decide where data from sensors will reside, in what format it will reside and how it will be shared.	Levstone, BED and Whysor	Ongoing
200709	20.41.01	UoN to send some data to LM (BED), MS (Whysor) and SM (Levstone) to have a first look at the data.	UoN	Ongoing
200709	20.41.01	Levstone to provide information about Levstone's database i.e. how organisations can self-enrol, what information	Levstone	Ongoing



		organisations will be required to provide, how customers can access this database.		
200709	20.41.01	Levstone to prepare a demonstration about the trial journey idea so that all partners can execute this and generate some data.	Levstone	Ongoing
200709	20.42	<b>WP T3 – Actions</b> UCD to assist each pilot test lead in quantification of embedded production phase GHG emissions using Cradle-to farm/processor-gate emission factor.	UCD	Ongoing
200709	20.42	UCD to assist each pilot test lead in obtaining data for the LCA approach i.e. production data, transport methods and current and alternative disposal routes.	UCD	Ongoing
200709	20.48	<b>WP Management – Actions</b> BED to work on improving internal payment procedure so that delays can be avoided with transferring funds to partners.	BED	Completed
200709	20.52	<b>WP Communication – Actions</b> NTU and all partners: to reflect exit of Dunbia and WD Meats joining REAMIT project in all REAMIT communication materials i.e. to remove Dunbia from REAMIT communication materials or to place WD Meats’s logo on top of Dunbia’s logo.	NTU and all partners	Completed
200709	20.52	NTU to remove name and logo of Dunbia from REAMIT website.	NTU	Completed

200709	20.52	NTU to send to all partners the logo of WD Meats to be glued to REAMIT roll-ups in place of Dunbia's logo.	NTU	Completed
200709	20.52	All partners to adjust their REAMIT roll-ups with the logo of WD Meats.	All partners	Completed
200709	20.53	<p>BED and pilot test leads will set deadline for collecting pilot test results. Information about the first three pilot tests can go online since we have some good information about them already:</p> <ul style="list-style-type: none"> <li>- Pilot test in the NL with Picnic – End of September – IH and Picnic can be contacted</li> <li>- Pilot test in France – end of September – AA will provide the required information</li> <li>- Pilot test in the UK with WD Meats – WD will provide information as soon as possible</li> <li>- Pilot test in Germany with Weyers – will need more time</li> <li>- Pilot test in Ireland (Cyberbar) with Manor Farm (TBC) – wait till after September for this pilot information due to COVID-19</li> </ul>	BED and pilot test leads	Ongoing
200709	20.53	NTU to upload information about first 3 REAMIT pilot tests on REAMIT website.	NTU	Ongoing
200709	20.54	All individual partners are requested to share with NTU (Sasha) personal or professional social media details, whichever they use to communicate about REAMIT activities. Based on partners' input, SB to develop a database.	All partners	Completed

200709	20.54	NTU to publish the social media database (password protected) of REAMIT partners in the REAMIT website.	NTU	To be uploaded by 21 January
200709	20.60	NTU to finalise the infographics and publish it on the REAMIT website.	NTU	Completed
200709	20.60	NTU to consider printing hard copies of infographics as REAMIT promotional materials.	NTU	When back at the university premises.
200709	20.61.01	NTU to create links for guiding interested parties to register on the REAMIT website their interest in REAMIT (pilot tests, technology, etc.)	NTU	Ongoing
200709	20.61.02	NTU to work with ShB to improve REAMIT videos and infographics.	NTU	NA
200709	20.63.02	<b>Decision taken during REAMIT Steering Committee Meeting – Actions</b>  BED to check with Una at JS whether the rolls ups have to be redesigned following Dunbia's exit and WD Meats joining REAMIT.	BED	Completed
200709	20.63.02	All partners to take a picture of their roll-ups inside their office with their roll-up banner unfolded and send it to BED and NTU.	All partners	Ongoing
200709	20.63.03	NTU to arrange a brief online training on how to communicate about REAMIT through social media.	NTU	Completed

200709	20.63.03	NTU to engage partners to help translate the infographics to French, German and Dutch.	NTU	Completed
200709	20.64	BED to prepare a confidentiality agreement template similar to the one prepared by UU for WD Meats.	BED	Completed
200709	20.67	ITT to consider possibilities of a new Irish pilot test with Freshbox technology.	ITT	Ongoing
200709	20.69	Whysor to take pictures of the pilot test with Picnic and send them to NTU.	Whysor	Unable to visit the sites due to lockdown
200709	20.69	UU to take pictures of pilot test with WD Meats and send them to NTU.	UU	Completed
200709	20.69	UoN to take pictures of Raman equipment and send them to NTU.	UoN	Completed
200709	20.69	Pilot test leads to make videos of their pilot tests and send them to NTU.	All pilot test leads	Ongoing
200709	20.70	BED to ask JS whether including REAMIT logo in email signature is compulsory.	BED	Completed
200709	20.71.01	BED to ask JS when to expect an answer about extension of the REAMIT project.	BED	Completed
200709	20.77	RR (BED) to keep partners informed about the Green Deal funding.	RR at BED	Completed

200709	20.79.02	Partners interested in contributing to EurOMA paper, to contact Lohit directly outside REAMIT online meetings.	Interested partners	Ongoing
200709	20.79.02	LM (BED) to champion preparing more research articles.	LM at BED	Ongoing

## Minutes from REAMIT Advisory Committee, Work Packages and Steering Committee meetings, 20-21/01/2021 (Zoom online meeting room hosted by UCD)

Present:

Name	Institution	Name	Institution
Ram Ramanathan (RR)	BED	Gerard Corkery (GC)	ITT
Katarzyna Pelc (KP)	BED	Gautam Samriya (GS)	ITT
Lohithaksha Maniraj Maiyar (LM)	BED	William Duffy (WD)	UU
Tahmina Ajmal (TA)	BED	Joan Condell (JC)	UU
Yanqing Duan (YD)	BED	Fabien Tencé (FT)	SenX
Gael Maugis (GM)	I&R	Imke Hermens (IH)	Whysor
Blandine Fortin (BF)	Valorial	Tom Verstraten (TV)	Whysor
Adrienne Gentil	Valorial	Annemarie Van Vilsteren (AV) RAC meeting only	East NL Development Agency
Usha Ramanathan (UR)	NTU	Alain Nouvellon (AN) WP T1 meeting only	Routhiau
Sasha Bennett (SB)	NTU	Matthew Thompson (MT)	Interreg NWE Programme JS
Simon McGraw (SM)	Levstone	Harry Hamilton (HH) RAC meeting only	Nifda
Davinder Bola	Levstone	Jaap Drenth (JD) WP T3 meeting only	Sensipdx
Ali Assaf (AA)	UoN	Eleanor Mathews (EM)	UCD

Gerald Thouand (GT)	UoN	Dimitrios Argyropoulos (DA)	UCD
Fionnuala Murphy (FM)	UCD	Nicholas Holden (NH)	UCD
Shane Ward (SW)	UCD	Gus Verhaeghe (GV) WP T1 meeting only	FlandersFood

Apologies:

Frank Goerte, Picnic

Day 1. Wednesday, 20 January 2021

09.00 – 09.10 Welcome to REAMIT meetings (Chair BED)

KP welcomed the attendees and presented an overview of the day. Special welcome was mentioned to Mathew Thompson from Interreg North West Europe Programme Joint Secretariat, the REAMIT project officer; and Annemarie Vilsteren, from East Netherlands Development Agency.

KP thanked Eleanor Mathews, UCD for hosting the meeting on behalf of UCD.

KP welcomed all and requested everyone to raise any questions they have before the meeting starts.

RR requested everyone to provide their consent to record the sessions. All agreed.

KP thanked partners for submitting their activity reports in eMS.

09.10 – 10.30 REAMIT Advisory Committee (RAC) meeting (Chair BED)

REAMIT project progress, including extension and capitalisation proposal (presentation by BED)

KP summarised the agenda for Day1; introduced Jaap Drenth, CEO, Sensipdx, The Netherlands as a speaker for second day on 'Market readiness levels and Technology readiness levels'; Alain Nouvellon, Operation Manager, Routhiau, France.

RR mentioned that Jaap (Sensipdx) is also partner from NL in the REAMIT Capitalisation proposal.

RR welcomed Harry Hamilton from Northern Ireland Food and Drinks Association, who also is part of the REAMIT Capitalisation proposal.

KP presented overview of the progress in the implementation of the REAMIT project.

WP T1 Adapting and pilot testing sensor technologies in agri-food supply chains

*WPT1 D1.1 Publication of open call*

The open call last date has been extended until 31 December 2021.

*D1.2 Companies recruited from across agri-business supply chain (min 5 companies) for pilot tests*

The following companies have been recruited for pilot tests:

- Picnic (NL)
- Routhiau (FR)

- WD Meats (UK)
- WEYERS GMBH (DE)
- Manor Farm (IE)
- Yumchop (UK)

*WPT1 D2.2 Test Roadmap*

I&R will update this section in first quarter of 2021.

*WPT1 Deliverable 3.1 Working prototypes using sensor technology*

- Whysor – Picnic (NL)
- Whysor – WEYERS GMBH (DE)
- UoN – Routhiau (FR)
- UoN – STEF (FR)
- UU – WD Meats (UK) on Clostridium Bacteria
- UU – WD Meats (UK) on Dry aging Chamber
- Ulster University 3D Fluorescence (UK)
- UCD Cyber bar (IE)

KP explained progress in each of the pilot tests. Detailed progress would be presented during WP meetings.

Pilot tests in the pipeline:

- New pilot test company in the NL (Whysor)
- Company producing frozen food (UK)
- NTU contacted at least 6 agri-food businesses in UK, including Pepsi, Starkey's fruits, Morrison's, Tesco and food charities within their business community.
- UU met with Finnebrouge, Galvia Digital and Riverwest Management to discuss new pilot tests
- ITT explored pilot possibility for developing pilot test in line with the Fresh Box initiative.

Q&A and comments

UR requested BED to liaise with some of NTU's contacts as a lead partner.

RR confirmed to offer support in this.

KP advised that Innovation and Enterprise services at BED helps to connect to SMEs in related areas.

REAMIT networking events can also help establish contacts with new companies.

AV: How many pilot tests is REAMIT looking for?

RR: As many as possible. The budget may accommodate 20 pilot tests.

AV: Are you looking for any specific food sectors?

RR: Fruit, vegetables, meat and fish, however, any kind of food is welcomed at this stage. We are also looking into extending REAMIT pilot tests to liquid food in the REAMIT Capitalisation project proposal.

GM confirmed that BbaMV is no more an associated partner.

**Action for BED: Remove BbaMV from the list of REAMIT Associated Partners.**

*WPT2 Big Data integration to reduce food waste*

*Deliverable 4.1 – 8.2*



KP summarised the progress made under different deliverables in WPT2. The server is installed at BED campus and ready for receipt of data from pilot tests.

#### WP T3 Business development of REAMIT technologies

KP reported that UCD has begun developing the life cycle assessment framework.

#### *WP Long Term*

- 2nd REAMIT Symposium was organised online by Valorial and I&R on 5-6 November 2020. The event was originally planned to be conducted in Nantes, France.
- Some potential collaborators were approached for REAMIT pilot test.
- BED submitted REAMIT application to 'Real Impact interdisciplinary research Fund Award' organized by Emerald Publishing (27 November 2020).
- BED has developed the REAMIT project Capitalisation proposal. Deadline for submission to Interreg NWE Programme JS is 29 January 2021.
- PPs have approached over 30 new actors in agri-food supply chains to promote REAMIT and invited them to participate in REAMIT pilot tests.

#### *WP Management*

- New recruits:
  - o Gautam Samriya has been recruited as Research Assistant at ITT for data analytics. He started a full time role on 30 November 2020.
  - o UCD is still in the process of recruiting two post-doctoral researchers. They are expected to conclude the recruitment process in the first quarter of 2021.
- Completed third round of RAC, WP, RSC meeting online (8-9 July 2020).
- BED submitted 3rd REAMIT progress report and payment claim to JS on 29 September 2020.
- BED submitted 3rd payment claim to JS: EUR 270973.65.
- BED transferred due amounts to PPS on 27 November 2020.
- Dunbia and Cottagequinn Farms LLP exit from REAMIT was completed in September 2020.
- More than 40 online meetings of REAMIT partners took place in the past semester:
  - o 6 monthly meetings of REAMIT staff at BED.
  - o 14 bi-weekly meetings of REAMIT sub-group (BED, NTU, UU, ITT).
  - o 3 monthly meetings of WPT1.
  - o More than 15 bilateral meetings between partners.
- Project Handbook has been updated with minutes of meetings and calendar for 4th REAMIT progress report.
- BED updated REAMIT risk log (5 new risks).
- BED's request for REAMIT project 12-months extension with budget was confirmed by JS (More detail discussed at RSC meeting).

#### *WP Communication*

- NTU Updated REAMIT website
- SB from NTU delivered a social media training for REAMIT partners (03 December 2020).
- NTU updated REAMIT logos following Dunbia's exit and WD Meats joining REAMIT.
- 2 new videos were developed by NTU and posted on the REAMIT website.
- 2 newsletters (September, December) were developed by NTU.
- 12 internal and external presentations of REAMIT were delivered by REAMIT partners.
- UU submitted an article to Sensors MDPI Special Issue "State-of the Art Sensors Technologies in Ireland 2020".

- UoN contributed to drafting the article “Review of potential Sensor Technology for Continuous Monitoring of Food Quality in Transport” with the section on Raman Spectroscopy.
- Three journal articles are being developed by BED. They are targeted for submission in 2021. Ram and Lohit submitted co-authored paper conference paper to Euroma 2021.
- Shared point space was created and hosted by NTU.

#### *Feedback from REAMIT Associated Partners*

RR requested opinions and suggestions from AV and AN.

AV: REAMIT infographics is very good. Testimonials will also help to explain benefits which the REAMIT project and approach can offer companies in agri food supply chains. She confirmed that she would be happy to share information about the REAMIT project to reach out to new companies in the NL.

KP: What would be the best way of getting the testimonials, would videos help?

AV: It depends on how you want to use it? For example, when you want to use it within different countries, different languages must be used or just use textual descriptions in every local language.

RR explained about the REAMIT Capitalisation proposal. It is an extension of the REAMIT work almost like including a new work package by focussing on new markets, new food sector. The REAMIT Capitalisation proposal focuses on liquid food with partners from BE, LU and NL. It also looks at meat industry in greater detail.

KP asked if other partners received feedback from their Associated Partners on the third REAMIT progress report, but there was no response from partners.

10.30 – 10.45 Tea / Coffee break

10.45 – 13.00

## **Work Package (WP) Meetings**

### **WP T1 Pilot Tests (Chair I&R)**

- 1) Deliverables as per the Application Form
- 2) Presentation of pilot tests by pilot test leads:

#### **Pilot test with Weyers, Whysor, The NL – presentation by IH, Whysor**

- The aim of this pilot test is to follow the (loss of) quality of food during the complete supply chain. The pilot test covers the full supply chain, from farmer through a warehouses until the end-user at the supermarket.
- The pilot test started in January 2020, however due to the pandemic, it effectively started in September 2020. There has been little contact with the company. Whysor purchased mcf88 sensor from Italy and a GPS sensor from digital matter. Data would be collected in Whysor cloud and later on it will be sent to BED server.
- Data will be collected to measure Co2, VOC, humidity, temperature, light, pressure, complaints, combination of foods, inputs from employees.
- Sensors were already delivered to the company in December 2019. They were installed in their office in February 2020, but soon Whysor lost connection with the sensors. On 15 September 2020, Whysor visited the

company. It was discovered that building at the company were made up of metal, which might have been the reason of the lost connection. Values of VOC were sometimes above maximum values.

- In November 2020, the contact person at Weyers confirmed they were ready to continue installation of sensors inside the trucks, but drivers raised issues regarding the installation of sensors inside the drivers' cabin due to harmful effect of radiation on drivers. Whysor discussed the possibility of installing the gateway inside the trailer. There has been little contact with Weyers since December 2020, and almost no response to any form of communication from the Whysor.
- IH proposed to look for other partner companies in Germany for pilot tests.
- German lockdown extended at least until 31 January 2021.
- At this point, IH confirmed they were one year behind schedule with the implementation of this pilot test.

#### Q&A

- RR expressed concerns that it would be a shame to lose one of our pilot partners.
- SM suggested a Bluetooth sensor could be used; but, again, it would need a driver's involvement in terms of help in installing on their phone.
- IH again expressed concern about losing contact with Weyers to even discuss a possible alternative solution for installation of sensors in Weyers trucks.
- RR suggested to explore another pilot test partner, while we think about what we can do with Weyers after we get another partner.
- RR said that the difficulty in reaching out to the German pilot test company (Weyers) might also be caused by the lockdown related issues.
- IH pointed out that Weyers scaled up at 50%-70% above their last year's operations. COVID-19 has increased demand for this online food supermarket.

#### Pilot test with Picnic, Whysor, The NL – presentation by IH, Whysor

- Picnic is an online supermarket in the NL.
- Frank could not join this meeting because of an urgent assignment.
- The main goal of this pilot test is to develop personalised cooling profile for each cooling box in the e-vehicle, determining how many cool packs are need for every cooling box.
- The second goal is to link customer's complaints with acceleration/shock detection inside the e-truck.
- 20 EMS sensors have been purchased to be placed in 20 cool boxes. Software update has been done by Whysor. 2 sensors were sent to Picnic. According to Frank, they have not been able to yet install the sensors because of Covid. They hope to be able to do it by end of January 2021.
- Values and data obtained are not interesting yet, because they are obtained outside weather conditions, i.e. cool weather does not affect food and does not cause food spoilage at this time of the year (January). In order to develop personalised cooling profiles of food boxes, outside temperature need to be higher. We will then be able to study food spoilage.
- Whysor will calibrate the other 18 sensors, and hopefully in 2 weeks' time they will be sent to Picnic. Whysor should be able to start installing them at Picnic trucks in March 2021.
- Dutch lock down will extend at least until 9 February 2021.
- Next steps in this pilot test:
  - o Validation of shock detection
  - o Calibration of sensors
  - o Installing sensors in cool boxes in Picnic trucks
  - o Gathering data

- Sending data to partners for analysis
- Establishing cooling profile per cool-box

REAMIT Whysor dashboard, presentation by TV:

- The values of the dashboard show temperature, humidity, battery voltage, shock detection.
- The data can be displayed in the form of charts.
- Shock data can be sent to a dashboard every 5 minutes, but it will be interrupted when there is a sudden change in the reading.
- TV showed a live demonstration of data being sent by tapping the sensor.
- Values of last 7 days averaged for every hour were shown as bar charts.
- A table showing acceleration values shown for X, Y and Z axes.

Q&A

LM: Has there been any change in the dashboard in the last 6 months?

TV: Constant developments are being made based on progress of pilots.

LM asked TV to share information about the changes through email for the purpose of reports.

LM: What are your thoughts on transferring the data to BED server? Are you going to continue to host this cloud service or do you have other solutions in mind?

TV: We are quite flexible to send the data to be stored in any server in a specific format. More details about it will be provided in WPT2 meeting.

TA: What is the basic purpose of the dashboard? Is it for demonstration, for research or for pilot partners?

TV: It can be used for multiple uses. It can help you set up your own dashboard, your own visual representation of data.

TA: Will there be any plug-in for data analytics?

TV: It would be best to plan a separate meeting, based on each data analytics partners' needs. Whysor is cooperating with SenX to add more analytics functionality.

TA: How would the data analytics fit in to the current architecture of the dashboard?

TV: There are many modules which can be used for this. The data from the dashboard can communicate through APIs. There is another module for data analytics using Python. There are in-house Python developers who can be used for linking this with data analytics.

TA: Where this will be stored later? In the BED server or in Whysor cloud?

TV: It is best to store data in both places.

LM: What is the location of the sensor data?

TV: Currently it is sent from Whysor's office.

Pilot test with Routhiau, UoN, France – presented by AA, UoN

Raman spectroscopy uses chemical composition of the food sample.

This pilot test uses temperature sensors in parallel with Raman sensors.

Pilot test has been carried out in lab on chicken samples provided by Routhiau (a food supplier company located in the region).

All data should be sent automatically to BED server. Later, data should be available to data analytics partners.

- 4800 spectra collected so far. Currently storing this data on a temporary solution of google cloud and shared with SenX.
- Currently working on integration of Raman spectroscopy in a transport environment.
- Raman signals are sent through the probe on to the chicken samples placed in packages. The temperature sensor has been installed and is working fine.
- There are some technical problems with automatic transmission of data. There is data access but we cannot save it.
- UoN met with I&R and IQM (manufacturer of the sensor) to sort this out. Ali also asked partners for help.
- Covid impact: Currently France is in curfew from 6 AM to 6 PM. Estimated delay in the implementation of this pilot test is at least 1 year. New industrial partners are difficult to find, as COVID-19 has had negative impact on communication, travel and meetings.
- Recovery plan: To expand the Raman testing to new food categories, test the technology on food from supermarket; Integration of this technology during food transportation – in a truck from STEF, or in a rented refrigerated truck.

#### Q&A

RR: We have to move from lab-based testing to actual transport environment. What is the stage of real time implementation?

AA: We are working with an intermediate solution until we find an industrial partner to test our technology. For example, using a small fridge inside a small car can simulate the transportation.

TA: Is there any positive results? What sort of output do you get from the Raman probe?

AA: We get a complete spectrum, the chemical composition of the sample, the proteins, the lipids etc. in the same spectrum. Using statistical analysis, we can say how the spectrum changes with time and say whether the quality is good or bad. In the project, we need help from partners to analyse these projection models.

TA: At present, are you just storing the data. Do you scan it time wise?

AA: We have optimal probe and record the data for 1 min. This data should be sent later to analytics partners.

TA: What is the size of the data for one chunk of data?

AA: One spectrum is 1KB which is not enough obviously. We can program our spectrometer to do measurement after 5min depending on the need of the user.

TA: Is the sample stationary or movable?

AA: It is complicated to check with many types of environments, first we measure in one area per time unit. So, at present it is stationary.

TA expressed interest to work with UoN and asked to share any potential research works for collaboration.

KP: Why Routhiau was chosen as a pilot test partner?

AA: UoN contacted many industrial companies for REAMIT. We know Routhiau from the past from a small collaboration. It is also a local company, which facilitates communication.

KP: Why chicken sample was chosen?

AA: This is the most important food matrices in the food industry. The chicken is the food at most risk.

KP: What will happen once you find a new company, like STEF for example?

AA: I cannot give you more information how this can be integrated. It may be that we can give them the samples directly to test or ask them to provide one truck for testing.

KP: One of the food was in a plastic foil. If you move to a car for example, can you do the test of uncovered or covered with plastic?

AA: Some experiments prove that we will be able to do that using some statistical algorithms. We work now to test this in the same condition during transportation.

KP: Is the lab-based analysis being done on raw chicken or processed chicken like chicken cutlet, fillet, cooked chicken or ready to eat chicken?

AA: We have analysis related to both raw as well as cooked chicken.

GS: Are there any plugins to make binary classification of good sample or deteriorated sample?

AA: Raman spectra can be saved in many formats. We use .txt file to send it to others because text files are smaller in size. We use MATLAB software for analytics. Lots of software can be used. A list can be sent over.

GS: The output of Raman data is a chemical composition. Is that correct?

AA: You have lots of data pertaining to proteins, vibration of molecules, on each sample. We can see or compare chemical compositions, but we can also see the difference between the intensity and richness of spectra, depending on the chemical composition of the sample.

DB: In order to understand the challenge, you are facing regarding pushing data upstream, how or what access control data is stored on a PC, micro-processor, logical controller, something else?

AA: Data stored in PC on .txt file. We use google file to send it. We do not need any logical controller to do that. For a big spectrometer, we may need high performance computer, but for REAMIT we only use a normal PC.

DB: So, we can run a service on the background to push the data upstream?

Ali: Yes. In our computer, we also have installed a sim card with internet connection to send data etc.

Dry aging pilot test with WD Meats, UU – presented by WD, UU

- The aim of this pilot test is to detect weight and quality loss of meat during dry-aging process.
- Temperature and humidity sensors will be installed to map readings across chambers to find if certain areas or orientations cause worse quality of meat or weight loss. For example, the source of heat could be detected and managed, somebody opening the doors, improper placement of motor etc. All these factors contribute to changing temperature and humidity conditions in the dry aging chamber.

- The goal is to develop the alerting system that can send a warning if in certain areas of a dry aging chamber temperature and humidity conditions have changed; as well as determine some way of reconfiguring the dry aging chamber.
- Christmas is busy period for WD Meats so UU would start the pilot test in January 2021.
- Sensors being used are Uralink UC11, temperature/humidity sensors, Gateway: Multi-tech MTCDT LoRa gateway.
- Elysens sensors were already connected to send data, any other sensors should be easy to setup with similar efforts.
- Status: Configured sensors loaned by Whysor. 5 Uralink sensors purchased, Sensors received on 19/10/2020.
- Gateway being configured to use new sensors so they are ready when WD Meats allow to install and provide site test results.
- COVID impact: due to Covid, there have been restrictions to access WD Meats factory.
- Lockdown in NI started on 26/12/2020 and may be extended until 6/02/2021.
- UU have experienced difficulties in contacting WD Meats in the recent months.

#### Clostridium bacteria pilot test with WD Meats, UU, presented by WD, UU

- Clostridium Estertheticum is an anaerobic spoilage-causing bacteria. It is prevalent in abattoirs. It produces non-toxic gases which spoil products early.
- The bacteria can spread easily, and it only grows once meat has been packaged in foil. Currently, detection of this bacteria at WD Meats abattoir is slow.
- The pilot test aims to investigate methods of detecting the bacteria in conveyor belts or in any other part of the factory. This will help WD Meats inform the cleaning routine.
- Rationale: The bacteria causes significant amounts of wasted beef globally.
- Ulster team has been looking into PCR swabs; placement students have been trained to do DNA extraction on WD Meats site. If however they are not allowed inside the site, Mark offered to conduct the experiments and send over the swabs to UU for further investigation.
- Whysor and BED are involved in the transfer and storage of data from this pilot test.
- Visit to WD Meats by William and Prof James was completed in August 2020.
- Update: 16 November 2020: UU purchased qPCR kits; STA completed and waiting to get it signed off. 2 Fresh Detect sensors received on 13 November 2020.
- Update: 18 January 2021: Meetings held with WD Meats and Sensipdx/Maastricht University to investigate liquid based bacterial detection but is expected to be less sensitive than PCR approach. UU is waiting to hear Mark's opinion on the approach. Ongoing analysis to get the limit of detection for the bacteria.
- Next steps: Once the student is trained, detection of main infection areas will begin. Main infection areas to be further investigated. James Dooley to leverage his contacts on this issue. Follow-up with companies on potential solutions.
- Meeting arranged with SeedAir, after REAMIT second Symposium (Nantes, November 2020) to investigate further solutions for bacterial detection. Meeting arranged with WD Meats, UU, Sensipdx, Maastricht University on 19 November 2020.
- COVID Impact: Due to restrictions, visiting WD Meats facility was not possible for months.

#### 3D Fluorescence pilot test at Ulster, presented by WD, UU

- Pilot idea: 3Df sensors can be used to make determinations of total bacterial count on solid products or liquids.
- Progress: UU have been conducting interviews with sensing companies to find an appropriate device.
- Testing results with FreshDetect device was presented.

Q&A

GT: What is the final goal of using the FreshDetect device? Is it for use at an abattoir or inside the truck by a driver?

WD: We don't have a pilot test in mind for now. These will not be really applicable to a final pilot test until the company is found.

RR: These pilot tests are going to be conducted inside WD Meats.

TA: WD Meats has got a system for measuring the bacterial count. Do they not cover the detection of clostridium bacteria?

WD: It is not covered. The problem is that the equipment will give the total count but will not say whether the bacteria is present. They use an acid spray on the conveyor belts, but still they find it in other places in the factory.

TA: How do they know that the bacteria is there?

WD: They do not know it. They just do a regular cleaning of the place for safe reasons.

KP to GV: There was a whole project dedicated to Clostridium bacteria in The NL (supported by FlandersFood). Can you tell us more about it?

GV: You can sense the total count of the bacteria, but it is challenging to sense a specific bacterium. Similar to how it is for Raman spectroscopy. We don't have a solution either to rapid sensing specific bacteria and would be interested to know more about it.

RR: In Belgium, clostridium bacteria problem is found predominantly in what sort of companies?

GV: In meat companies.

Cyberbar pilot test at UCD, presented by SW, UCD

- Aim of the pilot test: To develop a track and a trace system specifically applied to Chicken filets. UCD has been working with Ireland's largest chicken producer and food chain company.
- Cyberbar concept: To give an additional layer of protection rather than the conventional use of packaging. To avoid widespread use of plastic packaging. This can be avoided by directly etching on to the chicken fillet.
- QR codes can be loaded onto an ordinary smart phone and consequently product can be tracked right from the farm to the consumer.
- The goal is to extend this concept to vegetables and fruit: broccoli, braille, potato, melon.
- UCD has been also exploring extension of this concept to mushrooms.
- Lab based tests done to assess Cyber bar.
- Progress: No further progress since last meeting due to Covid.
- Covid Impact: November 2020 was very good with lowest number of cases in IE, but at the present the situation is not good. Ireland is in Level 5 lockdown and this will continue in 2021. Manor farm is interested in the pilot test but currently they are not able to continue the work on the pilot test.
- The process of hiring two post-doctoral researchers at UCD has been in progress.

Q&A

RR: When the pilot test is up and running, we will need to ensure that the pilot test is aligned with the nature of REAMIT pilot tests, particularly measurements of temperature, humidity etc.



SW: The Cyberbar pilot test will not only focus on Cyberbar but it will focus on gathering as much data as possible with the use of temperature sensing, geo location mapping, other data and send it back to the systems/website in place to analyse the information collected which can be downloaded using the QR code.

RR: Any other pilot tests in Ireland that will not only focus on Cyberbar but with some temperature sensors etc. will also be helpful. Any company that may not use Cyberbar but uses temperature, humidity sensing is also welcome.

SW: UCD is open and happy to take such ideas forward but COVID is impacting the contacts with pilot partners.

RR: Gerard talked about the Freshbox idea. UCD was also involved in the project. Any idea that can be adapted from Freshbox project and implemented for REAMIT would also be good.

SW: Agreed that Freshbox and REAMIT are compatible.

**Action for all pilot test leads: to upload all the presentations of pilot tests in SharePoint.**

**Action for Gael: to update the COVID impact assessment document based on inputs received from partners in WP T1 meetings.**

Freshbox project at MTU, presentation by Gerard Corkery and Gautam Samriya, MTU

GC announced that ITT is now officially part of Munster Technological University and will be using MTU logos instead of ITT.

- Freshbox is a separate EU project ITT was involved in a couple of years ago.
- ITT/MTU has recruited a new research assistant, Gautam Samriya, and welcomed him to present further.
- Freshbox is an active/smart container that stores/transportes each type of fresh produce in ideal conditions of respiration rate.
- Monitors with an innovative Integrated Sensor Kit to check key environmental features in container and allow traceability.
- Lightweight, manufactured with technology that saves energy and made of innovative recyclable material.
- Transports fresh produce harvested at higher maturity stage.
- Motivated because of high food waste across Europe and corresponding high range of carbon emissions, high time span of storage, transportation and distribution. Normal containers do not provide ideal environment for transport. Therefore, it is designed to address: reduction of food waste, extension of product shelf life and savings of fuel and energy consumption.
- Scope: Farm to final retailer through storage and processing industries.
- Consortium: IMAR, Aitiip (Spain), PCTAD (Spain), Transfer LBC (Spain), Lafuente Tomsey (Spain), S.L., Kolla & Co (Germany).
- The Freshbox contains specific lid with integrated sensor circuit, equipped with active substances and absorbers to maintain organic quality, for example ethylene absorbers or anti-microbial organic substances.
- Implementation was conducted in four stages: Selection of fresh produce and requirements of Freshbox design, Design of the Freshbox with the integrated circuit, Lab test, Actual tests in Spain and Germany.
- Experimental design: 6 fresh produce types were selected. Fresh produce was characterized based on tolerances to different atmospheric conditions and their vulnerabilities. Selection of optimal atmospheric conditions were made. Determination of O2 and CO2 tolerances for each type of fresh produce was made. The vulnerabilities and physiological damages were studied. Determined the ideal permeability of the Freshbox for each type of fruit or vegetable using a mathematical model.
- Final container was designed with appropriate tensile strength and other mechanical properties, lids with appropriate permeability levels and was finally integrated with sensor circuit. This design differentiates the Freshbox from the conventional container.

- Advantages of using Freshbox for Broccoli, grapes and strawberries very found to be relatively higher compared to other fresh produces.
- Socio- economic impact was evaluated and were found to be higher for different fresh produce categories.

#### Q&A

YD: What is the cost of Freshbox?

PD: One of the issues is certainly the cost to manufacture the box. ITT was involved more from the technology perspective rather than manufacturing the box itself. It was prohibitive to do mass commercialisation. Because of the lightweight material, there was a need to strengthen certain sections of the box because there was a slight decrease in the number of products that could fit into the box as compared to the standard pattern of shrink wrapping. A couple of companies were seriously looking into it but we are not very sure about the results of commercialisation.

*13.00 – 13.30 Lunch Break*

13.30 – 14.30: WP T2 Big Data integration and application to reduce food wastage (Chair BED)

LM presented an overview of WP T2.

#### **1) Deliverables as per the Application Form:**

Creation and launch of interface for each of the pilot tests for collecting data from sensors and sending it to cloud for use in a transnational Big Data infrastructure (by July 2021)

LM thanked Whysor for hosting the cloud.

The cloud included data from the new sensor from the Dutch pilot.

German pilot sensors need to be installed first.

Whysor and SenX were supporting UoN in sending data to REAMIT cloud.

Issue, UoN has to create a new structure of data, temporary solution to store data in google cloud. Data from the UoN pilot was shared to SenX to Data Analytics.

There is no meaningful data yet for data analytics from UU.

There is no update from other pilots yet as they are still in the discovery phase.

LM thanked Levstone for providing multiple options to run the software and is waiting for the data from different pilots. They were also helping to set up a Big Data server for use of Warp 10 software.

User Manual on launching the interface (by July 2021)

LM requested WD rom Ulster to connect the sensor to the cloud and send a document describing these efforts.

**Action: UU to send to Lohit a document describing UU's efforts to connect sensors to the cloud.**

**Action: Whysor to send to Lohit a document describing Whysor's efforts to connect sensors to the cloud.**

**Action for all pilot test leads: To do the same as above actions, i.e. to send to BED a document describing their efforts to connect sensors to the cloud. (This can be ignored if the procedure is same as in the document sent by Whysor)**

**Action: BED, based on inputs from pilot test leads, to develop an overview of approaches taken by partners to connect sensors to the cloud.**

**Action: BED will request for updates to the sensor connectivity document from Whysor if there are more connections of different nature from other pilots to the REAMIT cloud.**

**Action: Whysor to send to Lohit a brief document describing the different elements of the REAMIT dashboard and updates made from time to time.**

A big data platform with capability to collect and store sensors data from all REAMIT corridors (January 2020 – July 2021)

Lohit confirmed that procurement of the server had been completed by BED. The physical server has been installed in BED campus in Luton, UK. Lohit listed the big data hub equipment and noted that storage can be expanded if needed (e.g. graphic cards for pictures can be added in the future).

Lohit noted the server has been moved to a permanent location at BED to enable external access through a demilitarized zone (DMZ) for enhanced security. This is separate to the university's connection for extra security.

Lohit noted that BED worked with Levstone, who were very helpful, and suggested a systematic phase approach with phases 1, 2 and 3. Phase 1 has been completed. Phase 2 is in progress. Phase 3 has not yet been started. In the multi-phase approach the first phase involved installation of SQL software, testing of basic connection to the server through VPN and Remote Desktop (RDP) Access was tested for internal and external users. The second phase would involve testing connection to MS SQL data base software and configuration of MS SQL software instances. The third phase would involve collecting opinions of partners and developing a common architecture to standardise the process of sending and receiving data. Having completed the first phase, and with the ongoing second phase of the setup we aim to progress exponentially with the future stages in coming few months.

**Action: BED and Levstone will create and configuring SQL instance for Levstone on the REAMIT server. BED to work on provision of access to this instance for Levstone**

**Action: BED will create University network access, SQL instance, access to this instance and Windows server remote desktop access for MTUKerry**

**Action: BED will create SQL instance and access to this instance for other partners**

**Action: BED will conduct a meeting with all technical partners for opinion and consent for creating and providing access to a shared SQL instance on the server.**

**Action: BED will work with Levstone for creation of shared SQL instance and accesses to this instance for all partners**

**Action: BED will work with Whysor to transfer all pilot data from REAMIT Whysor cloud to REAMIT BED server once there is actual data from the pilots**

**Action: BED will continue liaising with Softcat on getting licensing quotes to license additional user connections to the server via Windows server remote desktop and to the MSSQL database software installed on the server.**

Reports on Big Data platform performance (January 2020 – July 2022)

A web-interface with self-enrol facility for enrolment of potential suppliers and consumers of food produce (January 2020 – July 2022)

The work on these deliverables has not started yet, as Big Data hub is waiting for data.

RR noted that Levstone is leading this facility.

SM made an overview presentation from Levstone's perspective – the aim was to discuss whether they can use a low cost sensor and a mobile phone as a router. One of the things needed is metadata on temperature to exclude irrelevant temp data. Simon demonstrated how the mobile app would be used and how it will be linked with the sensor data. Simon is working on getting this app ready for REAMIT pilot tests, specifically looking at 'How to add metadata' and the visualization. They have been working on security and new technologies for making web and mobile apps on a single codebase. Ram noted that this app will be really useful for Dutch and German pilot tests and the UoN.

SB asked SM if it is ok to feature this in the next REAMIT newsletter. Simon agreed and offered to provide clearer images.

User manuals for the Big Data platform and the web-interface (January 2020 – July 2022)

**Action: BED and Whysor to update the document in previous action with pilot specific or generalised data transfer procedure from REAMIT cloud to REAMIT Big data hub. (Whysor will need to contribute with data conversion or pre-processing and SQL script creation procedures, BED will contribute to description of SQL instance architecture to receive the data from REAMIT cloud and, store and view the data on the REAMIT Big data hub).**

Launch of smartphone APP for linking food owners, truck drivers and warehouses (January 2020 – July 2021)

Levstone tested three kinds of sensors for updating into the cloud.

Levstone has a new type of sensor but the timeline is not clear on this so this is not currently a priority. LM described the key features of the sensor. Levstone will confirm whether this will be used going forward

SM's above presentation relates to this deliverable. Deliverable 7.1 and Deliverable 5.3 are connected in that sense.

DB made a demo of the mobile app showing the capacity of including the data from the REAMIT sensors.

**Action: BED will organise a meeting to discuss next steps for implementation of mobile App on pilot test data**

**Action: Whysor will convert UoN sample data to blob format**

**Action: Whysor and BED will work together to deposit UoN data to REAMIT Big data hub**

**Action: After the data from either the UoN pilot or the Picnic synthetic data is ready, Levstone will have a look over the data and see if they can be used for the App.**

**Action: Whysor Levstone and BED will start testing the App on synthetic data from Picnic pilot**

An additional deliverable: launch of second database of potential buyers (food charities, convenience stores, etc.) in REAMIT corridors – the route where trucks would travel.

This database will be developed by Levstone.

User manual for the use of the APP (January 2020 – July 2021)

Deployment of the integrated IoT/Big Data analytics/Decision support technology (January 2019 – July 2022)

A user manual for the integrated IoT/Big Data/analytics/Decision support technology (January 2019 – July 2022)

‘Development of a Smartphone APP for REAMIT and a second database of potential buyers (food charities, convenience stores, etc.) in REAMIT corridors’, presentation by Levstone.

#### Q&A

1. Do we need a pilot specific architecture or a generic one to receive and send data?

TV suggests organising a follow up meeting to discuss the technical details. TV would like to get a picture of the data format and how often values are sent from partners.

2. LM asked about time frame of data collection for making big data. As this could take a year to collect from all partners.

3. TV said 2-3TB should be more than enough for sensor data from them but need to know from other partners.

LM reminded all pilot leads to send him the template as soon as new pilots are developed.

14.30 – 15.00: WP Project Management (Chair BED)

KP confirmed that Matthew Thompson was the new REAMIT officer at the JS; and Gautam Samriya was the new Research Assistant at ITT.

KP reported about the progress in the implementation of the project:

- RAC/WP/RSC meetings took place online in July 2020
- BED submitted 3rd REAMIT project progress report and payment claim to JS.
- BED transferred due amounts to PPs
- Dunbia exiting REAMIT was completed in September 2020. WD Meats have joined REAMIT as a sub partner of UU.
- 40 online meetings of REAMIT partners took place in the past semester.

**Deliverables as per the Application Form:**

**Project Handbook (by February 2019)**

Project Handbook (PH) has been updated regularly with minutes from online meetings, reporting calendar, appreciation emails received from external organisations. PH is available in SharePoint.

**Minutes of meetings of RSC, RAC and WP meetings (min 6, by January 2022)**

They are included in the REAMIT Handbook.

**Intermediate WP coordination (by January 2022)**

LP assists all WP leads with WP coordination. LP attends meetings of all WPs. Minutes from all meetings are included in the REAMIT Handbook.

**Annual risk reviews (2, by January 2022)**

5 new risks have been identified in REAMIT in the past semester. They have been discussed at RSC meeting and added to REAMIT Risk Log.

**Project reports (7, by July 2022)**

Based on inputs from PPs, LP developed and submitted (March 2021) to JS REAMIT 4<sup>th</sup> report.

KP reported about other REAMIT related work

- BED submitted to JS application for REAMIT project 12-months extension. LP received positive answer from JS on 29 November 2020 granting REAMIT 12-months extension including budget extension.
- RR has been working on the REAMIT Capitalisation proposal.

KP stressed that each partner needs to reach out to REAMIT target groups (specified in the AF). These are organisations at national/regional/local level, who should be informed about the REAMIT project. Information about each partner reaching out to its target groups needs to be included in the partner's progress report in eMS.

*15.00 – 15.15 Tea/Coffee Break*

15.15 – 16.00: Life Cycle Assessment for REAMIT technologies (Chair UCD)

- FM presented the first sketch of the LCA for the RAMIT project. She presented the broad overview of the approach; she noted that the background of LCA included the environmental impact of food waste along the agri-food chain. Essentially, the embedded GHG emission will be calculated along the supply chain. FM showed a recent publication on Embedded Emissions in Avoidable Food Waste. In REAMIT, the LCA will look at each pilot test in depth, specifically what food is the focus in each pilot test.
- Each stage in the food supply chain will be taken into consideration in LCA ('on the farm' stage, food processing stage, storage of food stage. We will need to know details about emission levels and forms, volume of food entering the supply chain, volume of food transported, information about the vehicle in which food is transported, load of the vehicle, fuel consumption of the vehicle.

- In REAMIT, data is needed to determine at what point in food supply chain, food becomes waste. We need to consider the impact of implementing the different sensors.
- This is a two-stage approach looking at the baseline scenario and potential environmental impact of implementing REAMIT.

#### REAMIT Pilots – Data needed for LCA

France – Chicken and Shrimp – sensors to be deployed in transport.

UK – Beef – Sensor to be deployed in food factory (processing).

Netherlands – Groceries – Sensors to be deployed in transport.

KP suggested taking the pilot test with Picnic for a simulation exercise. IH from Whysor agreed to provide input.

- 20 food cool boxes are loaded in the Picnic lorry, one box is designed for a particular customer.
- 20 sensors are installed inside 20 cool boxes but may not be in the same truck.
- FM asked who will identify degradation.
- Detection is noticed by the customer. Boxes are packed in large warehouses and sent from a large warehouse to a smaller warehouse and then loaded to a truck. IH confirmed that customers pick what is in boxes and only chilled products are kept in cool boxes.
- FM suggested getting data on each product in the cool box or an average on the whole box.
- IH to ask Frank whether they can get this individual product data or determine an average per box.
- FM stated the next step would be to determine the energy consumption (electric vehicle, fridge/freezer etc.) in Picnic.
- IH noted that ice packs are used in each cool box: Do we need to determine how many ice packs are used per trip of Picnic truck?
- FM highlighted the need to have for each sensor information on the battery used (lifetime and voltage of a battery), and manufacturing details of the sensors.
- ‘Big Data’ platform relates to the overall project (not pilot specific) – energy required to maintain the data centre is the main detail needed.
- Ram asked if there is a need for the embedded energy on creation of the server. FM agreed this needs to be determined.
- Ram and Lohit will work on this but may not have the embedded energy used to produce the server but will try to get this info.
- FM will need details relating to the amount of wasted food per track. This information will need to be obtained from Picnic.

**Action: Imke to ask Frank whether he can provide data on individual products in a cool box transported by a Picnic truck, or otherwise whether he can determine composition of a cool box on average.**

**Action: Imke, Fionnuala and Frank will meet to discuss conducting LCA with Picnic. FM will contact IH to organise this meeting.**

**Action: Imke to collect from Picnic details relating to the amount of wasted food per track.**

**Action: Ram and Lohit will work on determining the embedded energy needed for creation of the Big Data hub server at BED.**

#### Q&A

UR: do you calculate retail store shelf life and energy consumption i.e. quantity of food waste in warehouse or retail store or consumption place?

FM noted that this has to be determined in terms of REAMIT but embedded emission is to look at the entire chain where food becomes wasted.

FM: we intend to do a LCA study of a pilots which are likely to have data soon. This will help the other pilots. Once the postdoc is in place, FM intends to meet with individual pilots thereafter.

NS: Will it be a comparative LCA between a base life scenario and one of the pilots to assess the impact?

FM: yes, this is correct.

RR: WP T3 should get a kick start in the coming months in relation to the other deliverables.

WD noted that talks are ongoing in relation to holding monthly meetings to progress this work package.

16.00 – 16.15: WP Long Term

KP presented WP Long Term and highlighted the deliverables including networking events.

RR presented an overview of the REAMIT Capitalisation project, which extends REAMIT's reach and impact by looking at liquid fresh products (milk, milk products, smoothies, sauces). RR received support from one dairy farm, one company, small SME in the NL which specialise in sensor technology for liquids, two business support organisations (NI Food and Drink organisation, AgriFood from the NL). RR is hopeful there will be more pilot tests with these companies. New tech companies coming on board (Maastricht and Belgium companies, which are commercialising cool boxes with sensors). RR confirmed he was happy to be expanding to Belgium. Levstone would be taking the lead for a custom-made package for REAMIT including a website which will link to REAMIT with a registration ID. Overall, RR was very positive with this capitalisation proposal.

16.30 – 17.30: WP Communication

SB presented a summary of work done under this work package.

An online training on social media was delivered by SB. She confirmed the importance of social media, including creating brand awareness, to understand your target audience and to monitor your interaction. REAMIT uses Twitter, LinkedIn, Facebook, YouTube and Instagram. A hashtag #reamit4nwe was created at the beginning of the project and is continuously used on posts.



SM asked how to separate FB business page and personal page. SB noted this was possible in the 'Manage Page' tab. UR asked if it is possible to have multiple users at the same time. On twitter this is not possible but with Facebook and LinkedIn, this is possible.

### Facebook

SB noted the ads function on Facebook which targets your desired audience for a fee. Additionally, SB highlighted the insights function for monitoring the engagement with the Facebook page.

### Twitter

SB noted the use of hashtags is important because of the limited characters per tweet. Images are good to grab the attention of other twitter users. SB explained the '@' username handle, when used this sends notification to the user with that handle. SB demonstrated how to post a tweet. SB explained how to find out popular hashtags. Ram noted that it is possible to search popular hashtags by typing # followed by a word of interest (e.g. #Tech) into the search bar or within a tweet and suggestions will pop up. SB went through the 'Notifications' page.

### Q&A

SM asked how to connect using the Hashtag. SB demonstrated the search function using the Hashtag, how to 'follow' a page on Twitter.

SM asked what size image should be included. SB confirmed that resolution should be as low as possible but it will tell you when the image is too big.

### LinkedIn

KP asked how to upload images to LinkedIn, in what format? SB noted that you can upload a document or save it as a jpeg and upload as an image.

Day 2: Thursday, 21 January 2021

9.00 – 10.00: WP Communication (Chair NTU)

UR and SB gave the update on WP Communication. UR stated the communication programme is running well and praised SB for her work so far.

UR highlighted the updates in the past semester:

SharePoint was created for secure file storage so that all files can be in once place. UR asked all to request access and each person must be added before they can use it. She suggested all to save it as a bookmark for easy access. Through this share point site partners can share their weekly updates for the REAMIT site. UR reminded all to send email to alert new uploads to SharePoint.

- SB gave two sessions on social media training and is happy to deliver more if needed.
- There is a communication strategy document which includes goals such as attending events outside REAMIT to network. This document is available on SharePoint.

- UR demonstrated the website and reminded all to submit any suggestions and updates. She requested all partners to inform her on any presentations they may have given so that they can include in the newsletter/on website.
- UR asked all to upload photos onto the SharePoint to include in the REAMIT newsletter.
- UR noted an example in which KP linked a news story about reducing food waste which had been uploaded onto Sharepoint. UR encouraged others to upload stories like this from published stories such as local/national newspapers.
- UR noted that they are creating a storyboard to be completed by February. UR showed the various folders on Sharepoint for the stories.

**Action: NTU to finalise a storyboard.**

**REAMIT Video Strategy 2021**

- UR asked all to send SB information for the videos. SB listed the different videos included in the strategy, the first is in collaboration with UU which will be completed by the end of January. The video will include WD from UU talking about the pilot test with various animations. SB noted depending on the travel restrictions she intends to travel to partner to film or partners could submit their own videos. SB went through the other videos and their due dates and noted that she will be in touch with the various pilot leads. SB would like all videos to be started as soon as possible. Last video is a video on REAMIT highlights to 2021.
- RR noted that as more pilot tests are on board, more videos would be there. Each video should be a snapshot of each pilot study. RR encouraged all to think about what data is needed and information that can be supplied and send on to SB and UR.
- UR noted that SB is creating posters. SB noted that they are creating a poster for WD meats.
- UR asked if others have ideas for dissemination of information about REAMIT.

SB described the updates from the last 6 months which included the REAMIT Symposium posts, upcoming events and new video. SB noted that the symposium was a great success with 167 people registered, 46 posts using the hashtags and 64 retweets on Twitter.

SB gave a brief report on the networking events they have attended for networking. SB noted that there has been quite a few events where REAMIT members have spoken at. UR emphasised the importance of partner to inform her and SB when speaking about REAMIT at an event.

SB talked about the promotional materials which have been created in the past year such as banners, posters, brochures/flyers, newsletters. Two new videos for new potential end users and another highlighted pilot tests and new Infographics.

SB reminded all about the proposal for REAMIT Pilot Tests on the website i.e. a section for each pilot test with a short description and a video. SB noted that this has been stated but still needs more information. The aim is to be completed in Feb 2021. SB played a general animated REAMIT video as an example but noted that human involvement would be desired as this is more interaction.

**Action: NTU to create and populate a section on the REAMIT website dedicated to pilot tests.**

RR highlighted the need to update the logo for ITT which has now changed to MTU on the website. GC confirmed this and mentioned that Pat should have sent the new branding. SB confirmed that she has received it and showed the new banner which includes this logo. Kate asks about the banners which have already been printed. UR noted that the logo can be printed as a sticker to be stuck on top of the old logo.

SB touched on the social media training and asked partners for feedback and whether they would like another one. SM found it very helpful. IH stated the material was not necessary for her. RR noted the other social media application could be helpful as the focus had been on Twitter previously. GC suggested shorter sessions which target each application. SB stressed the overall aim of social media to share REAMIT work and engage a wider audience. GS noted that the session on Twitter was very comprehensive. SB offered one-to-one sessions to all partners.

Action: NTU to deliver one-to-one sessions on social media to partners, upon request.

REAMIT Newsletters:

SB encouraged all to share information to include in the next newsletter.

SB shared the urls for each social media website and the dedicated hashtag and encouraged all to share these widely and use while posting.

UR asked if a weekly reminder to submit info would be helpful please let her know. IH noted that the pilots are moving slow so there would not be much input each newsletter. SM noted that the technology updates would make great additions to the newsletters such as the Whysor dashboard and Levstone mobile app.

KP mentioned that some updates from SenX, UoN, UCD on the LCA framework, UU updates and NTU case studies and storytelling would be great as input for next newsletters.

10.00 – 10.30: Update from Valorial, 2nd REAMIT Symposium

Blandine Fortin (BF) noted the key figures such as 97 participants excluding Valorial staff, 39 completed questionnaires and 72 B2B meetings. She explained the Net Promoter Score (NPT) which is the participant satisfaction. The NPT was 42 which is really good and shows participants were very satisfied. BF showed the main event statistics such as nationality/origin and occupation of participants. BF went into detail of the REAMIT presentation and round table meeting satisfaction scores. The event organisation, content and communication was described in detail. BF showed photos of the event including the REAMIT presentations.

RR noted that he valued the face-to-face event in the afternoon and made very useful contacts at this.

KP gave feedback and noted the challenges related to the sudden lockdown and the move to online. KP liked the EU Commission presence, B2B meeting, and noted that the facilitation/translation interpretation was excellent. On the other hand, KP stated that REAMIT was not exposed enough and was not linked to the other presentations. Therefore, going forward KP would like REAMIT to be at the centre and have real impact. KP noted that it was a lost opportunity to recruit pilot companies in France as no companies have been identified

for pilot tests in France. The three strands of REAMIT; Sensors, Big Data Analytics and Business Strategy needs to be highlighted at the next symposium in the context of Agri-Food. Further to this, KP suggested that the outside speakers would discuss their work in the perspective of REAMIT in the same format. This would require a briefing beforehand.

RR agreed with points made by KP and noted that the agenda was not sent in sufficient time.

GM gave input regarding the challenges with organising the event and the changes in the initial agenda.

FM said, as for December 2021 REAMIT Symposium hosted by UCD, we hope to have a face-to-face meeting and will take the recommendation into consideration i.e. REAMIT at the centre, use the pilots as an example and inviting industry.

RR noted that the LP would like to be involved in the organisation of the 3<sup>rd</sup> Symposium hosted by UCD.

*10.30 – 10.45 Tea/Coffee break*

## **REAMIT Steering Committee (RSC) meeting. This meeting will be attended by all REAMIT partners (Chair BED)**

KP welcomed all to the REAMIT Steering Committee meeting and gave an overview of the agenda.

**1) The minutes of 3<sup>rd</sup> RSC meeting (8 – 9 July 2020) will be confirmed and partners will be asked to report their activities as per the minutes. For the list of actions please refer to the draft Minutes of the third RSC meeting (8-9 July 2020) attached to this agenda.**

RR reminded all that the minutes from July and action log are very long and requested all partners to have them reviewed in advance. KP brought up the minutes on the screen. RR requested if anyone proposes any changes to the minutes.

KP brought up the Action Log for partners to raise any important issues on the actions. She logged the updates on the action log as the partners noted their status whether they are completed or ongoing.

See action log for updates

### **Impact of COVID19 on partners:**

KP stated generally that all partners are delayed due to COVID19. RR gave partners an opportunity to highlight anything specific however everything was discussed in the presentations yesterday.

**2) The advices from RAC meeting and the decisions of the WP meetings will be discussed and approved after discussion.**

**3) Revision of REAMIT risk log.**

KP stated 5 new risks have been identified in REAMIT. They are classified as COVID-19 related or other risks.

Risks related to COVID-19:

WD Meats severely hit by the pandemic, in consequence, communication with WD Meats has been frozen and pilot work postponed until early 2021. UU unable to access premises of WD Meats.

UCD have not been able to recruit new staff which delayed Cyberbar pilot test. No new pilot tests have been developed at UCD.

Companies working with REAMIT partners do not have resources to allocate to REAMIT during the pandemic, which is causing delays in pilot test implementation, and responding to emails from REAMIT partners.

Other risks in REAMIT:

Weyers lorry drivers' objections have been causing delays.

UU may not be able to find a lab that sells samples of clostridium bacteria which means they need to grow themselves this bacterium, which takes 12 weeks and will cause further delay.

RR asked partners to announce any other risks and/or comment on risk ownership.

KP was concerned about the risk at UCD caused by hiring delays.

RR asked FM to consider contracting a short-term person in the meantime to facilitate communication in order to expedite the work. FM stated that hiring an outside person would not be in the budget, but they could organise this with one of the students. KP noted that UCD should request funds as soon as possible with the extension as budget unspent will be budget lost. FM responded that she is aware of this.

**4) 4<sup>th</sup> REAMIT project activity and finance report and payment claim (July – Dec 2020): calendar and points to remember.**

**5) 5<sup>th</sup> meeting of RAC/WP/RSC: 7 – 8 July 2021, hosted by Ulster University.**

RR requested a face-to-face meeting if possible or a blended meeting (physical/online) should also be considered depending on the pandemic situation.

#### **Other Meetings**

REAMIT Jan-2022 meeting will be hosted by NTU. Last meeting hosted by BED in March 2022 will now change due to REAMIT 12-months extension. This will be confirmed in advance.

**6) 3<sup>rd</sup> REAMIT Symposium in December 2021, hosted by UCD.**

RR reiterated that the feedback discussed earlier should be used when organizing this symposium. Ram encouraged UCD to engage with the other partners in summer about this event. FM confirmed that UCD will do this.

**Action: UCD to engage with LP and PP to organise 3<sup>rd</sup> REAMIT Symposium.**

## **12.00 – 12.30: REAMIT project 12-month extension (Chair BED)**

KP confirmed that BED sent a request to JS for a 12-month project extension. JS formally granted this extension including a budget extension. The new end date of the REAMIT project is 9 July 2023.

KP stated that the REAMIT budget needs to be revised in eMS by LP and PPs. This will be done as soon as the extension has been formally approved by the JS.

KP explained what the 12-month REAMIT project extension means. In the eMS, dates in all WPs will need to change to include the new period that will be added. A period covers the whole year in eMS. KP will meet with the JS REAMIT officer and will send a follow up email to partners. KP stated that she needs input from all partners by 29 January 2021 in line with the excel sheet that would be sent to all PPs.

RR discussed the revised dates for RSC, WP and RAC meetings which will be edited due to the project extension. RR provided a plan which he talked through and invited partners to comment. Two new RSC meetings will be required with the extension project. RR requested that Whysor host one (July 2022) and UCD host the other one (hopefully in person, in January 2023). FM stated that the 18-19 January is the first week of term so she requested to move the dates back, to 11 – 12 January 2023.

## **Q&A**

UR: regarding budgeting for the extension project, what is included in staff costs?

KP confirmed that external expertise is not included.

GM asked about the Symposium to be hosted by Valorial in December 2022.

RR presented the revised list and dates of future meetings and Symposia.

3<sup>rd</sup> REAMIT Symposium to be organised in December 2021. Dates can be arranged based on everybody's convenience.

Any underspent conference budget (for example in organising online symposium) can be carried forwarded towards future conference budgets. Any additional amount needed for the future event can be included in the capitalisation budget.

If the capitalisation proposal is successful, two integration workshops are planned – 1 hosted by Maastricht University or Sensipdx in the NL and another one hosted by BED in Luton, UK.

RR requested UU to hold another symposium in March 2023. RR requested William to pass on this information to Joan, because Maastricht did not agree to host this one.

Jaap confirmed that if necessary, they can organise the aforementioned workshop event. RR suggested it could be small 5-hour meeting with a refreshment lunch and to add a corresponding cost to the capitalisation budget. Ram requested Jaap to forward the final budget to Ram and Lohit. Imke, Whysor offered help to organise this if needed as they are situated only 35 kilometres away.

*12.30 – 13.00 Lunch break*

13.00 – 14.00: Introduction to Technology Readiness Levels (TRL) and Market Readiness Level. Developing shared REAMIT approach to TRL (Presentation by UU)

KP introduced Jaap Drenth from Sensipdx, The NL. His experience and insight will be valuable in technology readiness and bringing REAMIT technologies to the market.

Technology readiness Levels – presentation by WD, Ulster

- TRL developed in 1970's to express how a technology was evolving through a systematic, metrics-based approach. Initially used for aerospace and electronics industries but has moved into most industries now. Maturity measured on a scale from 1-9, with 1 being the earliest level of development and 9 being a completed product. It is used to describe the maturity level of which a project will begin and end.
- TRL helps understanding the technology status. It can help with risk assessment and overall management of the project. It can be used for decision making with technology funders.
- Two examples were presented – TRL of chemical fuel cell in lab development phase and a computer mouse.
- TRL definitions were presented for TRL 1-9. TRL 1 lowest level of technological maturity. TRL 9 highest. TRL 1 is basic principles observed, TRL2 is the Technology concept formed, TRL3 is basic Lab Experimentation, TRL4 is working at lab level such as with a prototype, TRL5 is validating in a relevant environment, TRL6 is the technology is demonstrated in relevant environment, TRL7 is demonstrating in operational environment, TRL8 is the system has been completed and qualified, TRL9 is actual system proven in operational environment.
- WD described the TRLs in further details on his presentation slides. TRL 1,2,3,4 is related to academic research, proof of concepts, publications etc. TRL 5, 6, 7 is known as the 'valley of death' past research but not ready for consumers. At this stage the project can face trouble. WD provided material on how to identify what level the technology is at and some example projects within his slides.
- For REAMIT it may range from TRL 2 to TRL 6.

Q&A

RR: At what level will you put the pilot tests with WD Meats?

WD: May be TRL 2.

RR: Dry aging pilot may be slightly more than TRL 2. It is for all of us to keep thinking on TRLs of each pilot. When the project started, RR reminded everyone that we started on the note that we are exploiting commercially available sensors to benefit companies and applications. We are working with proven technologies with unproven environment. So, in some cases, TRLs can be claimed higher than, say for example TRL 5, or TRL 6 instead of basic level TRL 2.

SM: It is difficult to progress forward to each TRL level. We are prototyping use cases, to find user needs. We don't know how good the saving will be. So, it is TRL 4.

Market Readiness Levels (MRLs) presented by WD, UU

- While TRL finds "if we can build it" MRL finds "will they adopt it".



- Mentioned the various 'Fit' which are ways to identify MRL. Definition of MRLs 1-9 were presented.

Jaap Drenth, Sensipdx, The NL, was invited to advise and share his expertise.

TRL and MRL presented by Jaap Drenth, Sensipdx

- TRL is important and it shows where you are with technology.
- Researchers tend to develop prototype without having a customer in mind which is common mistake and we should be looking for potential customers continuously once the technology has achieved TRL 3-4. The question "who in the market is waking up in the middle of the nights because they are looking for solutions that they don't have that we may be able to provide."
- Tests to go past TRL 5, 6, 7 will need large scale testing. With every test costing around EUR 20 000, and at least half a million for a set of 20-30 tests, you need investors to achieve this which can be found only if you are focussed.

#### Q&A

KP: When you start looking for customers at TRL 3-4, will you look for 1 customer or more customers at this stage or will you look to address 1 company completely and if successful look out more companies?

JD: For example, Sensipdx is a spinout of Maastricht University. MU has found two patterns with what they can measure microparticles in fluids. It is specialised in results on bacteria and small molecules. I am looking for very specific customers for whom I can make a prototype. They are customers, companies, managers. I will be able to do it at low cost, easy protocol, fast and with reliability, which are the features the companies are looking for. An egg company produces 1.6 million eggs are doing 30 tests per day. They have to wait 2-3 days to multiply the bacteria to see the results. If I can show the results immediately, that will help to improve their processes quickly. Another example: I spoke to oil business who trades tons and tons of oil. An immediate measure will also help them save costs. The most difficult part of TRL 4 is that people in the market want to use ready-to-use products. We won't sell to everybody because we have to be in a place where we can replace the existing process in the company.

KP: Is it possible to speed-up the WD Meats pilot test with more funds allocated to this pilot test and with the current timelines?

Elain (UU): We are still in the research process and at TRL 2. JC thinks that it is a long way to go to reach TRL 4, which may be out of the scope of REAMIT.

RR: There will be opportunity for us to discuss this on a future date and with more engagement between JD and UU through the capitalisation proposal, we hope to work more efficiently.

IH: How certain are we to be successful in the Capitalisation proposal?

RR: No clue from any one as to the possibility of success, but I am very hopeful. Although we may have quoted an expensive budget because of so many partners, I am still less concerned because we were advised that money is not an issue as long as we can show value for the budget claimed.



KP: In the reports from partners from UCD and UU, the two technologies, Cyberbar and clostridium bacteria problems are attracting interests from outsiders. Would it be ok to consider additional finance or investors to expand this technology or this would be at a later stage, or a different project?

JC: JC and FM confirmed that this would be too early to look at investors and could be looked at as a separate project.

#### **14.00 – 14.30: REAMIT Capitalisation proposal (Chair BED)**

The REAMIT Capitalisation project has been discussed earlier.

#### **14.30 – 15.30: Other points to discuss (Chair BED)**

Research articles from REAMIT activities:

Research work at BED, presented by LM

##### **A. Paper on sensor review – extension of EurOMA 2020 accepted paper (UU and BED)**

- Different types of sensor technologies were highlighted such as (1) Environmental sensors (2) Motion and optical sensors (3) Physical sensors.
- Sensors were chosen on the temp requirements, whether it is moving, and the connectivity requirements. LM showed the basic matrix used to determine sensor selection.
- LM described the parameters within a questionnaire which was designed and interviews conducted for the conference paper.
- LM noted a similar literature review will be conducted for fish and meat. Lohit intends to conduct more interviews to achieve a total of 10 interviews.

##### **B. Multi-objective modelling for waste aware agri-business supply chain**

- LM presented a sample scenario for modelling an online food supermarket using Picnic as a case study. IH noted that each crate is ordered by a different customer which has multiple products which would be difficult to relocate to a food bank for example. RR stated that it has to be assumed it is the same items in this model, but the real-life setting will be considered later down the line.
- DB noted that this is containerisation: a container within a container, at a certain point the QC1, QC2 and QC3 cannot go any further.
- DB noted that what will happen is having fish at different temperatures to vegetables for example. RR noted that we need a baseline model first which can be adapted at a later point in consultation with partners.
- LM went on to outline the modelling framework including the input/parameters and outputs.
- FM asked would they consider adding environmental impacts as a parameter in the model. LM acknowledged this and will consult with FM on adding this parameter in the future. RR agreed this will be considered in a multilevel model.

##### **C. EurOMA 2021 Extended abstract (BED)**

- LM described this abstract stating the title “xxx” and its purpose to build and solve a cost optimisation model that captures various items as listed in the slides.
- LM highlighted the basic network configuration and model features. LM also addressed the objective function, constraints and decision variables.
- LM mentioned the methodology, expected results and its contributions.

## Q&A

TA asked in terms of model, she agrees that the environmental impact is very important and must be considered with cost and time. Needs to have it as an important aspect at the start of the model as a foundation instead to input it later on. She pointed out that on the first paper in the questionnaire it may be helpful to include the health implications which relates to Weyer’s trouble with truck driver concerns.

IH: Each crate has groceries ordered by customer, so rerouting to an alternate demand point would be difficult. You can’t just put it into a different box and get it to a food bank.

LM: The QC point should be placed in such a position that the items can be rerouted and cannot be put in a place where the orders cannot be disassembled.

RR: This should be renamed as Picnic type case rather than a Picnic case. Unlike the practical setting, in academic and modelling sense, some assumptions need to be done to capture the implications of practical situation. To begin with we will assume a homogenous item, or multiple items, and other practical intricacies would be ignored. Such a model may not practically applicable but can be slowly improved once we have a working model.

DB: The food will be placed in different containers and QC1, QC2 or QC3 may not fit any more.

LM: I agree. It may not be practically applicable right away, but the idea is to develop a baseline model to study the flow of fresh food and food wastage involved.

FM: Would you consider adding environmental impacts as a parameter in your model that captures the Picnic type case. I have done this before and done the Greenhouse gas emission modelling before and given that REAMIT also has focus of studying impact of GHG emissions.

LM: Absolutely, the model can be extended further in future to consider GHG emissions. But for this case, we are considering the second dimension as time.

RR: One way of including sustainability is by including penalty cost function, or by minimising CO2 emissions as a second objective. Also minimising waste can be included as another objective.

TA: In terms of your final model, I don’t think we can consider cost or time on its own without considering the environmental impact as FM was also showing that even storing the data in the big data hub also has a contribution towards environmental impact. We need to consider all these comprehensively and would be wrong to ignore such aspects. For example, to study truck transport with temperature measurement and monitoring, it might not be necessary all the time, that temperature control will reduce the food waste in terms of the overall benefit. So, including all factors is important to have a holistic view.

For the sensor review paper, in light of what Whysor has highlighted, it is also important to consider health impacts of using wireless sensors. Making comparisons on different types of sensors with Bluetooth routers with respect to their emissions may be good value to the work, if possible, to be included.

RR: We will consider all these points which are very useful. In REAMIT these are not the only research works that can be conducted, but the idea is to kindle the research thought process. We have not yet started building data analytics models towards which we intend to work with greater effort in the future once we have models.

TA asked what platform.

LM confirmed it was MATLAB.

RR asked partners to submit ideas for future modelling work/journal articles.

**Action: All partners to submit to LP ideas for future modelling work/journal articles.**

Research work at UU, presented by WD, UU

- 'Sensing technologies for maximizing quality and minimizing waste of meat', journal paper on sensors submitted to JCP, May 2020, by UU.
- WD stated that the paper was submitted to a different journal as the initial journal was not suitable. WD stated it is under review and is currently doing the first round of revisions.
- The paper is essentially about beef waste along the supply chain and how it can be managed through sensor intervention.

Q&A

RR: Has it been published?

WD: It is sitting in the first review stage.

TA: You have no data yet from WD Meats?

WD: No. We are using secondary data.

Research work at UoN, presented by Ali Assaf – Raman Spectroscopy, UoN

- AA described the basics of Raman spectroscopy using graphics.
- The Raman effect is named after Indian scholar Raman. He won the Nobel Prize for discovering the Raman effect which is the basis for Raman spectroscopy.
- It captures several spectra such as fluorescence, phosphorescence, heat produced from the sample. We also have small fraction of photons in the Raman spectrum.
- Equipment: To do Raman spectroscopy, we need Laser, light sources, sample with some chemical bonds active for Raman, a probe, microscope. Then you need to interpret results by statistical analysis/data exploration. MATLAB can be used and analysis' such as PCA, DA, PLS, SVM, KNN may all be used but depends on the application. The equipment has evolved continuously from large laboratory setups to smart phone-based Raman spectrometer measurements.
- Raman spectrum for bacteria from Salmonella was presented.

- Benefits: Fast analysis, ability to check on small quantities, no sample preparation required, ability to do simultaneous verification of presence/absence of pathogens, lipids, proteins, carbohydrates etc. Therefore, widely applicable with thousands of scientific publications
- Applied on several cases of food: meat, beverages, dairy, fish, oil, honey, egg, vegetable.
- Detection of micro-biological contamination of food. Microorganisms are analysed by Raman spectroscopy and they are compared with a database to give the name of the species present in the bacteria. We can use it for the detection of more than micro level organisms.
- Some industries use Raman spectroscopy to detect sex of an egg and kill the eggs that are going to hatch hens (male) before the hatching of an egg at the earlier stage of incubation.

#### Q&A

RR: Have you produced any publications from REAMIT project and if you have produced, have you acknowledged REAMIT project in your publications?

AA: We have one publication in progress from REAMIT project, which focusses on the control or the evaluation of the quality of chicken meat by Raman spectroscopy. One paper was accepted in a conference in Spain.

TA: What wavelength ranges do you use for chicken sample?

AA: We use 785 nm wavelengths for chicken samples. This is chosen as wavelength level based on best results from experiments.

TA: What kind of light source do you use?

AA: We use diode laser source.

TA: Is 785 nm the wavelength of light source or emission?

AA: It is the light source. If we use a powerful laser, we may disrupt the sample. It is important to note that the power of around 100 mW on the sample. It depends on the time. If we run the spectrometer for short time, this power strength should be ok for larger time usage, even this would be powerful.

TA: Is it on/off system?

AA: Yes. We do have another system with continuous laser. But we don't use it for chicken samples as it would end up cooking up the chicken sample itself.

GS: Do you think the wavelength range in which this operates will have any health impacts?

TA: There are of course health impacts of using high intensity lasers. This kind of laser is being used by UoN for a split second and not for a very long time. There isn't any effect on people due to use of this technology as the probes are placed very close to chicken. But when this technology will be used alongside other sensors/routers to transfer the data and if these need to be placed near a truck driver or a person, there may be concerns that need to be addressed during the stage of integration with a gateway/router to transfer data.

AA: The use of laser source is of course very harmful to human, but for REAMIT pilot test, the technology used Raman probes directed on the chicken samples. Also, the truck drivers may have to appraised of required caution measures while they open/close the boxes etc. during the actual implementation.

RR briefly introduced the REAMIT pilot case study work being conducted by NTU, BED, and UU on WD Meats. A meeting was held between the three partners to discuss the ideas pertaining to showcasing of benefits from the two WD Meats pilot test. A draft document is currently being prepared.

UR summarised that we are collecting operational data from the case study company, WD Meats, WD is collecting the data and Lohit is working on the use of IoT related technology for the paper. Finally, it is going to be combined with the objective of REAMIT. UR shared sample case studies with LM and WD to show examples of case studies.

RR offered support with any publications but noted that authors should be restricted to 3 - 5. He clarified that this does not mean others cannot contribute. In line with RR's comment, UR proposed to create a shared table to fill in everybody's expertise area so that they are visible and accessible to all for mutual benefit.

KP shared that she is also interested to collect feedback from partners via email on how the meetings were organised. For example, opinions on what could be done better, any other feedback for improvement. RR welcomed all to provide their criticism as well only to use them for our own improvement.

TA congratulates and thanks Ram, Kate and all REAMIT members for the good meeting. She appreciated the progress made in all pilot tests.

UR asked whether this platform is only for REAMIT partners or are other partners also welcome. For example, if anybody want to present their work on using drones to measure food quality, can they participate if there is some take home for the REAMIT project?

RR said the RSC meeting is primarily for internal purpose of the REAMIT partnerships. We can have one or two sessions from external partners like we had one from Jaap in this meeting. We will start having separate meetings on research, to which anybody can be invited.

**Action: Usha will create a table in the SharePoint for REAMIT partners to fill in their research interests and area of expertise.**

RR asked if there were other questions or comments.

RR thanked all partners and closed the RSC meeting.

Matters arising and actions from RAC/WP/RSC online meetings on 20-21/01/2021

<b>Date</b>	<b>Minute/ Item</b>	<b>Action identified</b>	<b>Responsibility</b>	<b>Update: Confirmation of completion or reasons for non- completion</b>
21/01/20	21/02	Remove BbaMV from the list of REAMIT Associated Partners (associated to I&R).	BED	Completed
21/01/20	21/03/07	Update Pilot Test Roadmap in first semester of 2021.	I&R	Ongoing
21/01/20	21/03/07	Upload all presentations of pilot tests in Sharepoint.	All pilot test leads	Completed
21/01/20	21/03/07	Update the 'pilot COVID impact assessment document' based on inputs from pilot test leads at WP T1 meetings.	I&R	Ongoing
21/01/20	21.04	UU to send to Lohit a document describing UU's efforts to connect sensors to the cloud.	UU	Ongoing
21/01/20	21.04	Whysor to send to Lohit a document describing Whysor's efforts to connect the sensors to the cloud.	Whysor	Ongoing
21/01/20	21.04	To send to Lohit a document describing their efforts to connect sensors to the cloud.	All pilot test leads	Ongoing
21/01/20	21.04	BED, based on inputs from pilot test leads, to develop an overview of approaches	BED	Ongoing

		taken by partners to connect sensors to the cloud.		
21/01/20	21.04	BED will request for updates to the sensor connectivity document from Whysor if there are more connections of different nature from other pilots to the REAMIT cloud.	BED	Ongoing
21/01/20	21.04	Whysor to send to Lohit a brief document describing the different elements of the REAMIT dashboard and updates made from time to time.	Whysor	Ongoing
21/01/20	21.04	BED and Whysor to update the document in previous action with pilot specific or generalised data transfer procedure from REAMIT cloud to REAMIT Big data hub. Whysor will need to contribute with data conversion or pre-processing and SQL script creation procedures, BED will contribute to description of SQL instance architecture to receive the data from REAMIT cloud and, store and view the data on the REAMIT Big data hub.	BED and Whysor	Ongoing
21/01/20	21.04	BED and Levstone will create and configure SQL instance for Levstone on the REAMIT server. BED to work on provision of access to this instance for Levstone.	BED and Levstone	Completed
21/01/20	21.04	BED will create University network access, SQL instance, access to this instance and Windows server remote desktop access for MTU.	BED	Completed

21/01/20	21.04	BED will create SQL instance and access to this instance for other partners.	BED	Completed
21/01/20	21.04	BED will conduct a meeting with all technical partners for opinion and consent for creating and providing access to a shared SQL instance on the server.	BED	Completed
21/01/20	21.04	BED will work with Levstone for creation of shared SQL instance and accesses to this instance for all partners.	BED and Levstone	Completed
21/01/20	21.04	BED will work with Whysor to transfer all pilot data from REAMIT Whysor cloud to REAMIT BED server once there is actual data from the pilots.	BED and Whysor	Ongoing
21/01/20	21.04	BED will continue liaising with Softcat on getting licensing quotes to license additional user connections to the server via Windows server remote desktop and to the MSSQL database software installed on the server.	BED	Ongoing
21/01/20	21.04	BED will organise a meeting to discuss next steps for implementation of mobile App on pilot test data.	BED	Ongoing
21/01/20	21.04	Whysor will convert UoN sample data to blob format.	Whysor	Completed



21/01/20	21.04	Whysor and BED will work together to deposit UoN data to REAMIT Big data hub.	Whysor and BED	Completed
21/01/20	21.04	After the data from either the UoN pilot or the Picnic synthetic data is ready, Levstone will have a look over the data and see if they can be used for the App.	Levstone	Ongoing
21/01/20	21.04	Whysor, Levstone and BED will start testing the App on synthetic data from Picnic pilot.	Whysor, Levstone and BED	Ongoing
21/01/20	21.06	Imke to ask Frank from Picnic whether he can provide data on individual products in a cool box transported by a Picnic truck, or otherwise whether he can determine composition of a cool box on average. This is needed for LCA carried out by UCD.	Whysor	Ongoing
21/01/20	21.06	Imke, Fionnuala and Frank to meet to discuss conducting LCA with Picnic. FM will contact IH to organise this meeting.	UCD	Ongoing
21/01/20	21.06	Imke to collect from Picnic details relating to the amount of wasted food per track.	Whysor	Ongoing
21/01/20	21.06	Ram and Lohit to determine the embedded energy needed for creation of the Big Data hub server at BED.	BED	Ongoing
21/01/21	21.08	NTU to finalise a storyboard.	NTU	Completed
21/01/21	21.08	NTU to deliver one-to-one sessions on social media to partners, upon request.	NTU	Ongoing

21/01/21	21.10	UCD to engage with LP and PP to organise 3 <sup>rd</sup> REAMIT Symposium.	UCD	Ongoing
21/01/21	21.13.01	All partners to submit to LP ideas for future modelling work/journal articles.	All	Completed
21/01/21	21.14	Usha to create a table in the SharePoint for REAMIT partners to fill in their research interests and area of expertise.	NTU	Completed

**Actions for WP T2 (arising from WP T2 monthly meetings) with an update on progress (developed by Lohit)**

<b>Date</b>	<b>Minute/ Item</b>	<b>Action <i>identified</i></b>	<b>Responsibility</b>	<b>Update: <i>Confirmation of completion or reasons for non-completion</i></b>
200709	20.38.03	<p><b>WP T2 – Actions</b></p> <p>REAMIT sub-team (BED, Whysor, SenX, Levstone, ITT) to develop a scenario enabling the REAMIT server to receive and manage other types of data received from all pilot tests (not only data on temperature, humidity and VOC).</p> <p><b>Progress:</b> Discussed the implementation plan in 1 separate meeting b/w the BED Whysor, SenX, Levstone and MTUKerry (previously aka ITT) and in 1 WPT2 monthly meeting. It was decided to create separate SQL instances for every partner and a shared SQL instance which will show the sensor data for download to all partners. BED and Levstone met twice for the actual implementation.</p> <p><b>Sub Action: BED and Levstone will create and configuring SQL instance for Levstone on the REAMIT server. BED to work on provision of access to this instance for Levstone (Completed)</b></p> <p><b>Sub Action: BED will create University network access, SQL instance, access to this instance and Windows server remote desktop access for MTUKerry.</b></p>	BED, Whysor, SenX, Levstone, ITT	<ul style="list-style-type: none"> <li>• Separate SQL instances created for Whysor, BED, Levstone, MTUKerry, and SenX, others are ongoing.</li> <li>• Subsequently, rough historical data from Picnic pilot transferred onto the Whysor SQL instance.</li> <li>• Shared SQL instance creation is ongoing.</li> </ul>

		<p><b>Sub Action: BED will continue and complete the work on BED University network access, separate partner specific SQL instance creation and providing access to this instance for other partners. (Ongoing)</b></p> <p><b>Sub Action: BED will work with Whysor to transfer historical data from Picnic pilot (Completed)</b></p> <p><b>Sub Action: BED will conduct a meeting with all technical partners for opinion and consent for creating and providing access to a shared SQL instance on the server. (Completed)</b></p> <p><b>Sub Action: BED and Levstone will continue and complete creating and providing accesses to shared instance creation. (Ongoing)</b></p> <p><b>Sub Action: BED will work with Whysor to transfer all pilot data from REAMIT Whysor cloud to REAMIT BED server once there is actual data from the pilots (Ongoing)</b></p> <p><b>Sub Action: BED will continue liaising with Softcat on getting licensing quotes to license additional user connections to the server via Windows server remote desktop and to the MSSQL database software installed on the server. (Ongoing)</b></p>		
200709	20.40	<p><b>BED, Levstone and Whysor to collect data from sensors, including developing step-by-step written procedure for collecting data from each REAMIT pilot test and sensor.</b></p>	<p><b>BED, Levstone and Whysor</b></p>	<p><b>Ongoing until real data is transferred</b></p>

		<p><b>Sub Action: UU to send to Lohit a document describing UU's efforts to connect sensors to the cloud. (Completed)</b></p> <p><b>Sub Action: Whysor to send to Lohit a document describing Whysor's efforts to connect sensors to the cloud. (Completed)</b></p> <p><b>Sub Action: Whysor to send to BED a brief document describing the different elements of the REAMIT dashboard and updates made from time to time.</b></p> <p><b>Sub Action for all pilot test leads: To do the same as above Sub actions, i.e. to send to BED a document describing their efforts to connect sensors to the cloud. (This can be ignored if the procedure is same as in the document sent by Whysor) (Ongoing)</b></p> <p><b>Sub Action: BED, based on inputs from pilot test leads, to develop an overview of approaches taken by partners to connect sensors to the cloud (Ongoing).</b></p> <p><b>Sub Action: BED will request for updates to the sensor connectivity document from Whysor if there are more connections of different nature from other pilots to the REAMIT cloud.</b></p>		
200709	20.40	<p>BED and technical partners to develop a template for how WP T1 is connected to WP T2.</p> <p><b>Sub Action: BED and Whysor to update the document in previous action with pilot specific or generalised data transfer procedure from REAMIT cloud to REAMIT Big data hub. (Whysor will need to</b></p>	BED, Whysor, Levstone.	Ongoing

		<b>contribute with data conversion or pre-processing and SQL script creation procedures, BED will contribute to description of SQL instance architecture to receive the data from REAMIT cloud and, store and view the data on the REAMIT Big data hub).</b>		
200709	20.38.03	Levstone to work with Whysor in using Levstone's new platform for REAMIT.	Levstone	Ongoing Working on release of the software , The mobile app
200709	20.41.01	<p>Levstone, to launch the first version of the APP, which gives the ability to connect the sensor and start collect data.</p> <p>Response: this was discussed in 2 monthly WPT2 partner meeting and was decided to start implementation of App for UoN pilot and Picnic pilot. 1 other meeting between Whysor and UoN was held to discuss UoN data conversion</p> <p><b>Sub Action: Whysor will convert UoN sample data to blob format, status: Ongoing</b></p> <p><b>Sub Action: Whysor and BED will work together to deposit UoN data to REAMIT Big data hub, Status: Dependent on previous sub action</b></p> <p>Levstone to assist Whysor in using this approach with Picnic.</p> <p>Levstone and Whysor to assist other pilot test leads use this approach for other sensors in order to make comparison to see temperature profiles.</p>	Levstone,BED , Whysor	Ongoing – Connected to previous action –

		<p><b>Sub Action: Whysor Levstone and BED will start testing the App on synthetic data from Picnic pilot</b></p> <p><b>Status: Not started</b></p>		
200709	20.41.01	<p>Whysor to provide data Whysor is gathering at the moment through their API and to send it to Levstone's APP. (needs to be slightly rephrased need to work with BED to transfer data from BED server to and from App – feedback from DA to go to Bed and to be taken from Levstone) this required interaction with BA partners, how the will trigger an event to generate. Whysor already have a rule engine, to do this. Forward analytics to their API, in the form of a phone call or email or text message. Response . Meeting with Whysor, BA partner, Levstone and BED needed.</p> <p>Discuss this next week. Existing pilots UoN ? No data since last weeks. <b>(Completed)</b></p> <p>UoN data a starting point for next weeks meeting <b>(Whysor is doing the UoN data conversion)</b></p> <p>Can also use shock sensors for exercise with Levstone's App.<b>(Not started)</b></p> <p>Meeting 11am between, BED, Whysor, Levstone, SenX, ITT, UoN (if available)<b>(Completed)</b></p> <p>Elaborate different steps for mobile App implementation. Davinder to send a 2page</p>	Whysor	<p>Remaining parts</p> <p>For example, mechanism of hosting the data analytics module (client side or server side), mechanism of getting and sending the feedback from data analytics module to the smartphone App and mechanism of displaying the outcomes on the App, alert generation mechanism are all linked with previous action – Ongoing till previous action is completed (Atleast till data from one of pilots is available on the REAMIT server for access by</p>

		<p>description. Davinder to send before Monday.(Completed)</p> <p><b>Sub Action: After the data from either the UoN pilot or the Picnic synthetic data is ready, Levstone will have a look over the data and see if they can be used for the App.</b></p>		Levstone in the format they need)
200709	20.40	<p>BED, Levstone and Whysor to develop guidance on managing data collected from REAMIT sensors.</p> <p>Progress: This has been addressed in previous actions</p>	BED, Levstone and Whysor	Ongoing – MTU Kerry has prepared a document on data requirements
200709	20.40	Levstone to propose self-enrolment APP for end-user clients.	Levstone	Ongoing -
200709	20.41.01	Levstone to propose an early version of enrolment (to have a second database). This is to ensure that REAMIT partners have something to show to new companies (to be engaged in REAMIT pilot tests) i.e. to show real data so these companies can see what REAMIT can offer.	Levstone	Ongoing – Levstone will come back after having a chat
200709	20.41.01	Levstone to provide information about Levstone's database i.e. how organisations can self-enrol, what information organisations will be required to provide, how customers can access this database	Levstone	Ongoing -- Will come back



200709	20.40	Levstone, BED, Whysor, SenX and ITT to propose how data will be presented to end-user clients.	Levstone, BED, Whysor, SenX and ITT	Ongoing -
200709	20.40	<p>Levstone to develop a web progressive APP for visualisation and data presentation. (Last step)</p> <p>Take the data and use Whysor dashboard if possible to save repetitive efforts.</p> <p>Progress: Levstone suggested that previous actions must be completed before we can move to this action</p>	Levstone	Ongoing task- - Under development
200709	20.41.01	Levstone to prepare a demonstration about the trial journey idea so that all partners can execute this and generate some data.	Levstone	Ongoing – hoping after a release in a months time
200709	20.41.01	<p>UoN to send some data to LM (BED), MS (Whysor) and SM (Levstone) to have a first look at the data.</p> <p>Action: Lohit followup with Ali</p>	UoN	Completed
200709	20.39	BED to finalise purchase of equipment to build the Big Data hub at BED.	BED	Completed
200709	20.39	BED to finalise purchase of software necessary for the Big Data hub at BED.	BED	Completed
200709	20.39	BED (with the help of ICT at BED) to prepare a room at BED (Luton campus) where the Big Data hub will be mounted.	BED	Completed

200709	20.39	With the help of equipment supplier, BED to finalise building up of the Big Data hub, including installation of software.	BED	Completed
200709	20.40	Whysor to send responses to the questions on data collected in cloud (i.e. Is the common cloud platform going to be Whysor? Will vehicle route data be also transmitted? What is the capacity of Whysor cloud to store data?	Whysor	Completed
200709	20.41.01	BED, Whysor and Levstone to come together and make a decision on the best architecture to receive and send data to the cloud, data formatting and method of sharing with partners. The options to consider are to either use the server at BED or the reamit cloud set by Whysor and Levstone.	BED, Levstone and Whysor	Completed
200709	20.41.01	Levstone and Whysor to ensure that all sensors used for REAMIT pilot tests are compatible with the smart phone APP from Levstone.	Levstone and Whysor	Completed
200709	20.41.01	Levstone, BED and Whysor to decide where data from sensors will reside, in what format it will reside and how it will be shared.	Levstone, BED and Whysor	Completed

## APPROVED MINUTES FROM REAMIT ADVISORY COMMITTEE, WORK PACKAGES AND STEERING COMMITTEE MEETINGS, 7 –8/07/2021 (TEAMS ONLINE MEETING ROOM HOSTED BY NTU)

Attendees present:

<b>Name</b>	<b>Institution</b>	<b>Name</b>	<b>Institution</b>
Ram Ramanathan (RR)	BED	Richard Cook (RC)	SEMLEP
Katarzyna Pelc (KP)	BED	Fionnuala Murphy (FM)	UCD
Joy Eze (JE)	BED	Shane Ward (SW)	UCD
Tahmina Ajmal (TA)	BED	Tamiris Da Costa (TC)	UCD
Yanqing Duan (YD)	BED	Xavier Cama (XC)	UCD
Gillian Weaver (GW)	HMF	Nevedha Saravanarajan (NS)	UCD
Gael Maugis (GM)	I&R	Ali Assaf (AA)	UoN
Simon McGraw (SM)	Levstone	Gerald Thouand (GT)	UoN
Davinder Bola (DB)	Levstone	Pratheepan Yogarajah (PY)	UU
Wayne Baker (WB)	Levstone	James Gillespie (JG)	UU
Fabien Tencé (FT)	SenX	Bryan Gardiner (BG)	UU

Gerard Corkery (GC)	MTU	Joan Condell (JC)	UU
Gautam Samriya (GS)	MTU	Adrienne Gentil (AG)	Valorial
Usha Ramanathan (UR)	NTU	Chris Nankervis (CN)	Weather Logistics
Sasha Bennett (SB)	NTU	Imke Hermens (IH)	Whysor
Alena Pivavarava (AP)	NTU	Tom Verstraten (TV)	Whysor
Frank Gorte (FG)	Picnic	Abi Adefisan (AA)	Yumchop

Apologies:

Matthew Thompson (MT)

Day 1. Wednesday 7th of July 2021 – Morning Session

**09:00 - 09:10: Welcome to REAMIT meetings (Chair BED)**

21.15

It was announced that the next RAC/WP/RSC meeting will take place on 19-20 January 2022, hosted by Ulster University.

A general overview about the meeting agenda was provided by RR, who also requested all partners with associated partners to keep chasing to know about their progress so far.

**09.10 – 10.30 REAMIT Advisory Committee (RAC) meeting (Chair BED)**

21.16

**REAMIT project progress in the period: 1 January 2021 – 30 June 2021, including extension and capitalization proposal (presentation by KP, BED)**

The Advisory Committee partners were not available for the meeting. A progress report had been sent to them in advance, though feedback had not been yet received.

A list of associated partners, to whom REAMIT progress reports are sent, was shown on a slide. Those were: GIOS, East Netherlands Development Agency, Radboud University, Jean Routhiau, Société Des Transports Européens Frigorifiques (STEF) and Bioresearch NI.

Feedback from the East Netherlands Development Agency was received (more at the end of the presentation).

21.16.01

**WP T1: Adapting and pilot testing sensor technologies in agri-food supply chains.**

**Deliverables:**

- Deliverable T1.1.1. Deadline for recruiting companies through Open Challenge Call was extended until 30 June 2022.
- Deliverable T1.1.2. Recruiting of five companies from across agri-business supply chains to participate in REAMIT.
- List of companies that have been recruited and progress has been made: Picnic - NL, WD Meats (2 pilot tests) - UK, Routhiau - France, Yumchop - UK.
- New companies recruited for pilots: Human Milk Foundation – UK, Musgrave – UK.
- Pilot tests in the pipeline: Biogros - LU, Van de Huijgevoort Groep (VHG) – NL, a box with sensors (UCD) pending company recruitment - IE.
- Pending responses from the following companies: Glen Affric – UK, IGRECA – FR, Prince de Bretagne - FR, Carton Group – IE.
- Company lost: Weyers – DE.

**Action: As REAMIT is still recruiting companies, all partners have been encouraged to keep approaching companies for pilot tests.**

- Deliverable T1.1.3: Working prototypes using sensor technology:
  - Temperature and humidity sensors (Picnic, WD Meats, Yumchop, HMF, Musgrave, Biogros, VHG)
  - Raman spectroscopy (Rothiau, IGRECA)
  - 3D fluorescence (WD Meats)
  - A box with sensors (being developed by UCD)
  - MTU exploring Freshbox initiative
  - Bluetooth IoT sensor (being developed by Levstone)

**Other activities in WP T1:**

- A template for a non-Disclosure agreement was developed
- NTU/BED connected with Weather Logistics company (UK)

21.16.02

**WP T2: Big Data integration and applications to reduce food waste.**

**Deliverables:**

- Deliverable DT2.4.1. Creation and launch of interface: REAMIT dashboard has been improved; Whysor and SenX working on integrating “WARP-10” into the dashboard.
- Deliverable DT2.4.2. User manual on launching interface: Whysor has delivered two parts of the manual.
- Deliverable DT2.5.1. Big data platform that can store and collect all pilot data: a server was set up at BED. Connections between the data server and REAMIT partners were established; each partner was granted access. Preparatory work was started to handle incoming data from pilots. Data analytics

partners are currently evaluating which data is needed. As for the license big data server, consortium would opt for the unlimited access.

- Deliverable DT2.5.3. Web-interface with self-enroll for potential suppliers/consumers of food produce: Levstone has developed a web page available for initial client enrolment. Complete system to be developed by the end of the year.
- Deliverable DT2.7.1. Launch of smartphone APP for linking food owners, drivers, warehouses: Levstone developed a working app. Available in Google Play store.
- Deliverable DT2.7.2. User manual for the app: Levstone is working on it.

21.16.03

### **WP T3. Business development of REAMIT technologies.**

Deliverables:

- Deliverable T3.1.1. Assessment of REAMIT technologies (mapping/systematic review): UCD started collecting information regarding the amount of food waste in different supply chains and the location in the FSC where it occurs.
- Deliverable T3.1.2. Life Cycle Assessment (LCA): UCD developed the REAMIT questionnaire with the data requirements.
- Deliverable T3.2.1. Current and identified future REAMIT technology assessment report: Ulster University has started collecting information regarding Market Readiness Levels and Technology Readiness Levels.

21.16.04

### **WP Communication**

Deliverables:

- Deliverable C1.1. Communication strategy document has been updated – available in SharePoint.
- Deliverable C2.1. Website launch: continuously being updated. NTU also had an initiative to develop a stand-alone website; NTU going ahead with purchasing and developing REAMIT stand-alone website.
- Deliverable C2.2. Social media. Increase in communication from partners (LinkedIn, Twitter).
- Deliverable C3.1. Project banners, posters and flyers: 2 videos and 2 banners have been developed for Picnic and WD Meats (pending company approval).
- Deliverable C5.1. Journal articles. The following have been developed:
  - A book chapter (Research team in BED): “Fighting Food waste: How can artificial intelligence and analytics help” – submitted.
  - A conference abstract: “A theoretical sustainability model on using IoT sensors and cloud systems for reducing food waste and emissions in the fresh food sector” - accepted for presentation at Logistics conference. Authors: Lohitaksha M Maiyar, Ramakrishnan Ramanathan and Lakshmi Swamy.
  - A conference paper. “An optimisation model for cost effective integration of transportation network design with quality control to reduce fresh food wastage” Authors: Lohitaksha M Maiyar, Ramakrishnan Ramanathan, BED.

- Sensor review journal paper (no further progress done since last meeting).
- A number of partners have started working on case studies for: WD Meats, Picnic, Routhiau, Yumchop, HMF.

21.16.05

## **WP Management**

- A number of new staff has been recruited in REAMIT:
  - Dr Tamiris da Costa started working on life cycle assessment of REAMIT technologies from UCD.
  - Dr Xavier Cama started working on REAMIT pilot tests from UCD.
  - Dr Trevor Cadden assists in finding additional pilot tests at UU.
  - Dr Lakshmi Swamy started working part time on developing research publications from BED.
  - Dr Joy Eze started working part time on setting up the Big Data server from BED.
  - Tobias Leenders, a graduation student, assists with integrating WARP-10 in the Whysor platform.
  - Dr James Gillespie replaced William Duffy at UU.
  - Dr Sahar Ahmadzadeh replaced Dr Lohit Maiyar and will coordinate the implementation of WP T2 and other REAMIT activities at BED.
  - Dr Alena Pivavarava joined the project on 1 July 2021 from NTU.
- Deliverable DM 1.1. Project Handbook - All information about reports, minutes of meetings and presentations are included in the Project Handbook. The project handbook is stored in SharePoint and the partners are welcome to review it.
- Deliverable DM 1.2. Minutes of meetings of RAC/WP/RSC - The minutes of the REAMIT meeting in January have been developed and shared with partners and will be discussed and approved on July 8th.
- Deliverable DM 1.3. Intermediate Work Package coordination - A list of all the different meetings that took place in the last semester are, as follow:
  - RAC/WP/RSC on 20-21 January 2021
  - 5 monthly meetings of WPT1 (I&R)
  - 4 monthly meetings of WPT2 (BED)
  - 2 bi-monthly meetings of WPT3 (UU)
  - 10 bi-weekly meetings of REAMIT sub-group (BED, NTU, UU, UCD, MTU)
  - 5 monthly meetings of REAMIT team at BED
- Deliverable DM 2.1. REAMIT Risk Log - New risks were identified in the REAMIT project and updated based on the inputs from the partners:
  - Risk for not having a pilot test in Germany due to losing Weyers and no success in recruiting a new company in Germany.
  - Absence of a proper French pilot test and an Irish pilot test.
  - The sensors cannot be fitted at Yumchop and HMF by Whysor physically due to travel restrictions.
  - Risk for sending the sensors by post from Whysor to Yumchop and HMF.

- Risk of less effective communication if pilot test partner companies insist on remaining anonymous in REAMIT communication activities.
- Risk of further delay in WP T1 implementation due to the lengthy procurement process at BED.
- Risk of shortage of IoT sensor equipment provided by suppliers: Whysor confirmed that some of Whysor's equipment suppliers do not have much equipment in stock and these companies have warned Whysor about delays (caused by COVID-19) in getting equipment in stock again.
- Deliverable DM 3.1. Project progress report - 4th REAMIT progress and finance report submitted to JS in March 2021. Everything was approved.

21.16.06

#### **WP Long Term**

- Deliverable DLT. 1.1. Network prospectus - The first deliverable is a list of actors approached by different partners in the last semester when partners engaged with different actors to invite them to participate in the pilot. The list includes:
  - BED: Human Milk Foundation, Unilever, Ocado, Weather Logistics, SEMLEP
  - NTU: TTK Confectionery, Glen Affric Brewery, Weather Logistics, local agri-business companies, IoT companies, The D2N2, Growing Notts, large supermarket chains & food suppliers.
  - UU: Musgrave, Knockbracken (the catering branch of HSCNI / NHS), Aurivo, Dale Farm, Henderson group, NIFDA and Kepak, HSCNI.
  - Whysor: Biogros, Van de Huijgevoort Groep (VHG).
  - I&R and Valorial: Prince de Bretagne Vegetables Cooperative
  - UoN: IGRECA
  - MTU: Meat Technology Ireland, Enterprise Ireland
  - UCD: Carton Group
- Deliverable DLT. 1.2. Networking events - 3rd REAMIT Symposium will be hosted by UCD (Nov / Dec 2021)

21.16.07

#### **Challenges encountered by the consortium in the past semester (January – June 2021) with the implementation of the REAMIT project:**

COVID-19 pandemic and lockdown (2nd lockdown from December 2020 until May 2021) caused delays in the implementation of all WPs for at least 18 months.

- WP T1:
  - Agri-food companies prioritized primary processes, not research.
  - Businesses were not responsive. It has been difficult to maintain a productive relationship with pilot test partner companies.
  - Lost pilot test company in Germany as Weyers decided not to proceed with pilot test.
- WP T2:
  - Very few data generated for analytics so far.



- WP T3: Limited progress in WP T3.
- WP Management:
  - All meetings of REAMIT partnership took place online.
  - Responses from PPs and colleagues were slow, causing delays.
  - Payment from LP to PPs has been delayed at BED.
  - Purchase of equipment at BED for pilot tests has been delayed.
  - Not possible to travel to the sites of pilot tests in the NL, DE, UK.
  - Staff turnover at BED and UU may cause risks of lost continuity and expertise in the implementation of WP T1 and WP T2.
- WP Communication:
  - NTU were not able to travel to visit sites of REAMIT pilot tests to take high quality video footage. Instead, videos had to be made based on materials sent to NTU by PPs via email.
- WP Long Term:
  - Due to delay in WP T1, WP T2 and WP T3, it was not possible to develop briefings for policy actors about the REAMIT approach, or effectively promote REAMIT, its achievements and impact among local, regional and national businesses and policy.

21.16.08

**Feedback from BED's Associated Partner: East Netherlands Development Agency.**

They have had some questions, e.g.:

- What is the biggest progress you've made compared to the last project meeting we have attended?
- What are the biggest issues, besides COVID causing delay?
- And consequently, which actions can we as an associated partner, take that could help the REAMIT consortium?
- The East Midlands Netherlands agency is planning to develop another project proposal (for H2020 or INTERREG Programme).

21.06.09

**Overall progress observed in REAMIT:**

- In the last month different companies showed interest in conducting a pilot test.
- The idea is really appealing, and it is only a matter of time that we are able to find more French, British and German companies to engage in pilot tests.
- The installation of a big data server, which implies that the partners and analytics partners can start receiving the data once the data starts flowing.
- Work in progress related to two new case studies: Yumchop and Human Milk Foundation.
- From a project management point of view, the big achievement was also to complete the recruitment of new staff at UCD, BED, UU.
- Communication materials and videos are coming at frequent intervals.

- Benefit of having the new, stand-alone REAMIT website, in addition to the one provided by the Interreg NWE Programme, and its role in attracting more companies and audiences.
- Biggest issues faced by the REAMIT consortium, besides COVID:
  - Losing the German pilot test with Weyers was not necessarily because of Covid, but due to the attitude of lorry drivers who were hesitant to having a new device installed in the driver's cabin.
  - Current difficulty in France and in Ireland in finding pilot test companies.
  - Due to Brexit, there is extra paperwork related to moving goods from the Netherlands, from Whysor partners to pilot test companies in the UK.
  - Most companies participating in REAMIT pilot tests prefer to stay anonymous, which does not help to promote the REAMIT project. However, new partners like Human Milk Foundation and Yumchop are positive about being associated with REAMIT and agree that the consortium use their names in REAMIT communication materials. This is important as it may help convince other companies to participate in REAMIT pilot tests.
- How associated partners can help the REAMIT consortium:
  - There are three associated partners associated with BED: GIQS, East NL Development Agency and Radboud University from the Netherlands. East NL Development Agency continuously keeps sending some information and updates about the REAMIT project within their network; while GIQS has been very supportive in the past in approaching new companies in Germany and the NL for REAMIT pilot tests.
  - The REAMIT partners will keep linking with associated partners from France to find out how we can get more support from them.

## **Meetings of Work Packages**

### **10.45 – 13.15: WP T1: Adapting and pilot testing sensor technologies in agri-food supply chains.**

21.17.01

#### **1) Deliverables as per the REAMIT Application Form**

Deliverables to be submitted by June 2021 => June 2022 (as per the extension). There are three main deliverables to report:

- Deliverable 3.1. Working prototypes using sensor technology - The sensor and scanning technologies will be tested along with other traditional sensors where needed and adaptations carried out wherever needed. Data flow to be checked. At the end of the pilot test, new working prototypes will be developed.
- Deliverable 3.2. User manual for each pilot test - A user manual documenting the experience of the pilot test and a step-by-step guide of good practice in each pilot test will be developed for the benefit of users willing to test REAMIT technologies in the future.
- Deliverable 3.3. Report on the pilot test and development of the sensor prototypes - A report on the 5 sensor-based pilot tests will be compiled by participating partners and posted on the project webspace. It will describe in detail the experiences with the pilot test and give recommendations for future pilot tests.

**Action: each pilot test lead to develop a user manual for each pilot test. A user manual for each pilot test shall document the experience of the pilot test and a step-by-step guide of good practice in each pilot test.**

**Action: Each pilot test lead to write a report on the pilot test and development of the sensor prototype.**

**The report will describe in detail the experiences with the pilot test and give recommendations for future pilot tests.**

## **2) Presentation of pilot tests by pilot test leads and pilot test partner companies**

21.17.02

### ***Pilot test in Ireland inspired by Freshbox (Xavier Cama, UCD):***

- CyberBar is being developed by UCD and is a system that provides traceability of food, and this is achieved by incorporating QR codes onto food directly, which can later be read by a smartphone.
- Provides full chain traceability, i.e., can give information on origin or where the food is coming from.
- It is designed to prevent variability from the food processor to the consumer and it can assist in the reduction of food waste and in the compliance with legislation or product withdrawal.
- Ongoing Covid restrictions in Ireland is a challenge because it generates difficulties for commercial partners to engage in effective pilot testing.
- Another challenge: laser etching of samples onto food matrices – assessing the scale and cost of pilot design for successful implementation.
- The first phase of the pilot test will last approximately two months (July and August 2021) and aims to prove the concept and gain knowledge on both strengths and limitations. It is expected that demonstrating the tests and producing some outputs will encourage other companies to establish partnerships.
- Associated partners: Munster Technological University.
- The pilot is constituted mainly by a readily deployable box or container that will contain the food product and the temperature sensor.
- The location will be incorporated via smartphone GPS.
- The next steps will be to implement the pilot in pilot scale testing conditions and at the agribusiness company environment, evaluating how food waste can be reduced in the food supply chain.

**Action: UCD to report the results of the first stage (prove the concept carried out in July – August 2021) of the pilot test in Ireland inspired by Freshbox.**

**Action: UCD to approach min 10 companies in agri-food supply chains in Ireland to demonstrate the tests inspired by Freshbox idea, to encourage their participation in REAMIT pilot tests. To do this, UCD may ask for help Innovation & Enterprise service at UCD, Interreg NWE Programme Contact Point person for Ireland or Enterprise Ireland (or equivalent services).**

21.17.03

### ***Pilot Test with Raman Spectroscopy (with Routhiau, IGRECA, ADRO) in France (Ali Assaf, UoN)***

- The aim of this pilot is monitoring of the quality of food during storage or transportation by an optical sensor across the Raman spectrometer inside a refrigerated truck.

- The data generated should be sent to the driver or the operator in order to have an idea about the quality of food and if they have any problem or any damage during transportation, the operator should be alerted to go to the nearest point of shipment.
- Pilot lead: I&R / UoN (Gepea).
- Company: Routhiau (chicken meat), IGRECA (egg products), Markets & Prince de Bretagne (fruits & vegetables), Stef (refrigerated food transport), Pescanova (seafood).
- Technology: Raman spectroscopy, optical technique, and sometimes additional national physical chemical sensors to validate the observations.
- Routhiau: It is a company located in the west of France. The pilot test started on chicken samples. Many experiments are ongoing, more than four hundred and sixty spectrums, transmission to data storage server. The next phase is the transition between the lab experiment to the real condition in the food trucks (Scheduled on 9th July), including renting a truck.
- IGRECA: Started the discussion about the pilot with the company. Many samples were analysed.

**Action: UoN to move the Raman spectroscopy pilot test to the next phase – transition from the lab experiment to the real conditions in the food trucks (scheduled on 9 July 2021). This includes renting a truck.**

**Action: UoN to confirm whether IGRECA and Prince de Bretagne will participate in the pilot test with Raman Spectroscopy.**

21.17.04

***Pilot test with Human Milk Foundation in UK (Dr Natalie Shenker and Gillian Weaver, Co-Founder and Director of Human Milk Foundation, UK)***

- The Human Milk Foundation is a UK charity, funded to support research and education, but also specifically into human milk banking.
- Mothers who are breastfeeding their babies, if they have surplus milk, either from home or from hospital, they're able to donate.
- As with blood banking or tissue banking, the donors all undergo health and serology screening.
- The milk is stored frozen by the donor at home or in hospitals. The milk is collected and transported frozen. Then it is heat-treated at 62.5 °C for 30 minutes and stored until tests confirm it's safe for consumption.
- The Human Milk Foundation provides the milk to hospital neonatal units for particularly premature and very sick babies whose mothers temporarily or in the long term aren't able to provide any or enough of their own milk.
- Whilst the milk is being stored at home or in the hospital, the temperature is monitored by the donor or by the hospital.
- In the milk bank, all freezers are monitored by temperature sensors together with alarms linked up to computers, but also to emergency phone systems.
- The sensors from REAMIT have been dispatched from Whysor's office in The Netherlands but have not arrived yet at HMF. So, the Human Milk Foundation hasn't been able to start testing yet.
- The Human Milk Foundation is unable to accurately monitor the temperature during the transportation, but they want to ensure that the milk has remained in optimal conditions throughout

the whole period – from when the milk has been extracted until when the milk has been delivered to a prematurely born baby.

- There are national guidelines and international guidelines for the storage and transportation of human milk. Once the milk reaches the hospital, it's down to them to ensure that they follow the guidelines.
- At the moment, four to five hours on the back of a motorbike is the maximum time that they believe human milk can be transported. But it would be useful to be able to transport milk over longer journeys and not have to stop, because if they have to bring the milk, for example, with milk coming down from Scotland to somewhere in the south of England. Then they have to stop midway and get it into a freezer and break the journey and then transport it again later not to risk it stays in the transport box for too long.

## Q&A

Q: What is the financial cost associated with human milk waste?

GW: Human milk donation is a very noble service. It is not just about the financial cost of not being able to use milk, but it is about the fact that human milk is a very special product. It's donated, it's akin to blood or donation of tissue. We do everything to ensure we are able to use all the milk maximally and optimally. But inevitably we are not always able to use the milk if it fails the very stringent microbiology test before and after pasteurization. But one of the things that would be an unnecessary waste of milk would be a problem in the transportation if we were not able to monitor the temperature in which the milk was transported, for example. If the milk arrives at the milk bank and we do not know for how long the milk has been at a certain temperature, we could quickly test and pressurize it. But if we don't have any record of transportation temperatures, then we have to discard it. For this reason, the REAMIT project could make the difference for us – between being able to use the human milk or not. The impact on the donors and on the milk bank staff who are committed to ensuring that this precious resource is used, can't be underestimated. The social cost is the most important. We can't ignore financial costs whenever we have any waste, but we can take steps to minimize those wherever possible.

Q: Are the motor-bikers volunteers?

GW: Yes, in terms of transportation, HMF use volunteers almost unique to the UK. Transportation of human milk is outside the framework for transportation of food. Although it is regulated as a food in the UK, however some aspects of food regulation are very difficult to apply to human milk, particularly the labelling, because every container of donated human milk has a different nutritional content. Their contents make it impossible for HMF to properly label each milk container.

Q: How HMF is financed?

GW: When human milk banks operate within a hospital, they're funded by the hospital, either within women and children's services or by the neonatal unit. Human Milk Foundation is self-funded, we raise money, do some fundraising, and have donations to the charity. The costs related to milk that HMF supplies to hospitals is reimbursed. All the costs related to this milk are reimbursed. The REAMIT would be of great help because transportation of human milk is only going to grow. And human milk needs to be transported into emergency situations, emergency scenarios.

**Action: Whysor to assist online with installation of sensors at HMF.**

**Action: BED to obtain from HMF images and videos documenting installation of sensors at HMF, for the purpose of developing REAMIT communication materials.**

21.17.05

***Pilot test with Picnic in NL (Frank Gorte, Picnic and Imke Whysor)***

- The aim of the pilot is to have a personalised cooling profile per cooling box at Picnic transport in small trucks.
- It will be accomplished by analyzing the outside weather conditions combined with the delta temperature inside the cooling box during transport.
- The second aim is to link complaints of customers to how the box was handled.
- They are going to analyze data regarding xyz acceleration of the box with shock detection.
- The pilot test will start in July 2021, so Tom and Imke will be visiting one of Picnic's fulfilment centers to install the sensors and start collecting data.
- The equipment used for this pilot test is the MS sensor, which measures temperature, humidity and acceleration.

**Action: Whysor to install sensors at Picnic's fulfillment center.**

**Action: Whysor to confirm whether sensors installed in Picnic's trucks will be re-programmed to also collect correct data on shock detection.**

21.17.06

***Pilot Test with WD Meats in UK (Joan Condell and James Gillespie, Ulster University)***

***Dry-Aging pilot test:***

- WD Meats have chambers where they put the meat after being processed in the factory, they store the meat in the chambers for approximately 3 weeks.
- The temperature in the chambers can be inconsistent from one side to the other and for this reason temperature and humidity sensors will be installed.
- There is an alerting system to warn if certain areas will cause (meat) loss.
- The pilot started on 6 July 2021 and the first trial will end 3 weeks later (27 July 2021).
- 5 sensors have been installed in dry aging chamber: two installed closest to the door (one left and one right), two sensors installed closest to the refrigerator (one left and one right) and one sensor in the middle of the chamber.
- The gateway has a range of 10 kilometers with the sensors. Problem with one sensor, which wasn't recording the data. The dry aging chamber is insulated and there's many layers of metal in there, which can compromise the signal strength.
- A dashboard with data was presented. It was observed that when the doors are opened there are significant spikes in both the temperature and humidity.
- There's about 1°C of difference between the left and the right side of the chamber that can be due to the airflow in the trailer or it could be a slight variance on the sensors and some calibration can be required.

- Marc suggested different structuring of carcass's/sensors after findings from the first trial before running the experiment again to observe the effects.

**Action: Ulster to obtain from Marc at WD Meats information about weight of carcass before entering dry aging chamber and when leaving dry aging chamber.**

**Action: Ulster to specify what lessons have been learnt from first pilot test with dry aging chamber, discuss it with WD Meats and based on it propose how the second pilot test in dry aging chamber will be run.**

**Action: Ulster to run a second pilot test in dry aging chamber (for another 3 weeks).**

21.17.07

***Pilot Test with WD Meats in UK (Joan Condell and James Gillespie, Ulster University)***

***Clostridium Bacteria pilot test:***

- Clostridium is an anaerobic spoilage-causing bacterium, so it doesn't depend on oxygen to reproduce. It produces a non-toxic gas which spoils products early, can spread easily and the current detection system is slow. The bacteria result in significant amounts of wasted beef globally.
- Metrics to detect currently unknown, but PCR will be used initially.
- A similar system is being developed at Maastricht University, they said that it could be configured for various bacteria, but the level of detection is unknown.
- REAMIT pilot test on clostridium bacteria aims to offer a faster method of detection of CB allowing for immediate clean-up of surfaces when detected.
- A UU student is going to do the swabbing and testing and is currently being trained in this process.
- Professor of Microbiology James Dooley brought on the project to advice.
- Marc from WD Meats has said Clostridium Bacteria has started appearing on the production line again. He is freezing swabs for Ulster to collect and perform tests on.
- Ulster have submitted a purchasing request for the DNA extraction kit required to process the frozen swabs. The company selling this equipment said they had no more of this kind of kits and offered another type of kit.
- UCD agreed to provide half of their Clostridium supply, but no updates on when this will be delivered.
- COVID has caused delays by restricting access to university facilities as well as WD Meats facilities.
- A machine in the lab at Ulster used to analyze swabs is broken. Analyses of swabs from WD Meats can be done when this machine is repaired or replaced by a new one.

**Action: Ulster to purchase DNA extraction kit required to process the frozen swabs from WD Meats.**

**Action: Ulster to get an update internally when a new machine will be purchased and when swabs from WD Meats can be analyzed.**

**Action: Ulster to analyze swabs from WD Meats.**

21.17.08

***Pilot Test with WD Meats in UK (Joan Condell and James Gillespie, Ulster University)***

**3D Fluorescence pilot test**



- 3DF sensors can be used to make determinations of total bacteria count on products or liquids.
- Current progress – conducting interviews of sensing companies to find an appropriate device.
- Further meetings held with WD Meats and Sensipdx/Maastricht University.
- On-going analysis to get the limit of detection for the bacteria.

**Action:** Since James and Xavier expressed interest in working closely on developing this pilot test, they are requested to develop a plan of actions to take this pilot test forward. Ulster and UCD to develop a plan of actions to take 3D Fluorescence pilot test forward.

21.17.09

***Pilot Test with WD Meats in UK (Joan Condell and James Gillespie, Ulster University)***

**Musgrave pilot test**

- Pilot test involving delivery vehicles with a cash and carry system based in Belfast. They provide food around 15-to-20-mile radius of Belfast.
- They use refrigerated vans; however, they don't have any sort of temperature or humidity sensor.
- There is potential for reducing food waste in the delivery vehicles with refrigeration by essentially installing temperature and humidity sensors, so the people in the office will receive an alert of the risk of spoilage.
- The start date for the pilot is the end of August 2021.
- The decision support system consists in collecting data from the temperature and humidity sensors. The sensors will be connected to the phone using Bluetooth. Bespoke android app on phone updates data to cloud using 4/5 G.
- The next steps involve developing an android app required to handle data from the sensors, which will be done by Ulster. Application will need to be tested prior to deployment. Install sensors within vans.
- A bespoke app is going to have to be developed which connects to the thermobeacon and uploads the data to the Reamit cloud. Developing the app will be a non-trivial task and hence will take time to create and test.

**Action:** Ulster to work with Whysor to specify which sensors to be installed in Musgrave vans.

**Action:** Ulster to install sensors within Musgrave vans.

**Action:** Ulster to develop an android app required to handle data from the sensors in Musgrave pilot test. Application will need to be tested prior to deployment.

21.17.10

***Pilot Test with Yumchop in UK (Abi Adefisan, Yumchop and Katarzyna Pelc, BED)***

- Abi Adefisan is the co-founder of Yumchop together with Michael Adefisan.
- Yumchop was set up in 2016 and officially launched in 2018 when the business got the tender with TUCO to supply into universities across the UK through the vending kiosks. In 2019, they started deploying their meals into universities.
- The aim is bringing accessibility of the African flavors into meals. Not only introducing African meals, but they are also bringing the culture together.



- They offer meals from around the world, e.g., Italian pasta, and they put African flavor to it.
- The meals are frozen, are free from preservatives, and free from any additives.
- They use a special technique where they flush food, freeze it within a very short time period and another team labels it. So, they keep the consistency and enable a good shelf life (18 months of shelf life) to preserve the meals and also make sure that the meal still stays the same quality from the time that it's been frozen all the way to when people eat it.
- There is a microwave that's incorporated within the vending machine that allows people to not only get the frozen food but prepare the food to eat there.
- They supply the food in universities and had the NHS approval to supply into hospitals in UK.
- In the factory, during the manufacturing process they need to ensure not only the temperature of the fridge, but also that in case of any drop in temperature or any increase in temperature, there are appropriate corrective actions to address it.
- There was an episode when all the temperature in freezers increased (the freezers have got to be -18 °C) and because of that, the company lost the products.
- When the temperature inside the freezers increases, the quality of the meals not only goes down, but also the safety of the meals becomes problematic.
- In terms of solving the problem, Yumchop are working with the project Reamit with the sensors that can automatically send data to their emails or phones.
- The project would enable Yumchop owners to make sure that they are taking appropriate actions to tackle any potential risk. It would also reduce the loss of revenue.

## Q&A

Q: Did you have situations where you had to throw away food because the products were older than 18 months?

AA: We don't overproduce at the moment, but with the expansion of the company, expansion of our client base, we're going to be looking at producing more in advance, much more. But at this moment, we've never had a situation where we've had the food for more than 18 months. We have tested our products for 18 months for 10 years and we've seen that the quality has been consistent.

Q: Can you tell us about the regulatory requirements that you need to respect? Producer needs to follow test temperatures in the morning and in the evening. Do you do it manually at the moment?

AA: We do it manually, we have to do it in the morning, in the daytime. We have hazard analysis, political control points for managing the food manufacturing or production process. The food temperature is a hazard of microbial growth. The regulations make sure that our produce is in the temperature that is always at -5° C or lower.

KP: How do you monitor vending machines?

AA: Yes, we are monitoring the vending machines. We get real time data at the vending machines if it's dropped below a certain threshold. The data goes to our email. That's something that we want to validate, having a regular sensor that actually does much more, not just a special mode when the temperature falls below the temperature settled. It would be great to be able to have temperature monitored automatically on a regular basis.

Q: We need to have much more focus on temperature because even a single degree of something to drop is causing a huge wastage. There is a temperature drop certainly to trigger the alert. If you have an app within your mobile phone and you receive an alert, you need to go physically to set it off. Is there any way they can do it through mobile devices to control the temperature?

Answer: We do have sensors which you can connect to the smart phone app, and which give you real time tolerances, and send alarms.

RR: There are certain things that are causing these problems in the case of Yumchop, these are anomalies in temperature. In many cases, the anomalies need to be fixed manually, and the automated systems may not help. For example, if somebody has opened the door, there is no way for the machine to close the door.

**Action: BED and Whysor to support Yumchop online with installation of sensors and connection to the cloud.**

21.17.11

### **3) How to recruit partner companies/organisations for REAMIT pilot tests. Overview of possible routes (Katarzyna Pelc, BED)**

- Own networks, talking, discussing, presenting within professional networks.
- Making presentations about the Reamit project at external events (conferences, networks, food networks).
  - BED has PowerPoint presentations ready which can be shared with PPs for this purpose.
  - You may also play REAMIT videos to present the REAMIT project and pilot tests at various events. The videos are short and offer a concise summary of the REAMIT pilot tests.
- National Contact Point persons in Interreg NWE Programme. Contact details of these persons are available on the website of our founder. We have at least one contact point person for each country in our region. And the role of this process is precisely this kind of support linking us to the target group that we need, in this case, companies or agrifood companies in supply chains. Some pilot companies in REAMIT have been recruited in this way. Normally these people are very supportive, and they genuinely want to help. So, this is a very strong group and it's a very effective way of approaching new companies and finding new companies for pilot tests. However, this still dependant of the organization in charge in the country. In France, they do not have possibility of promoting on a large agri-food network.
- Approaching clusters in agri-food, bioeconomy can enlarge as well as other clusters like organization network (Trace & Track euverion network by Valorial).
- Participate in online B2B meetings to find potential new contacts as a lot of events are now online and allow to participate event if there is a limited number of companies that are relevant. For example, VALORIAL participated in several brokerage events co-organized by EEN.
- Approaching Innovation & Enterprise (I&E) service (or similar) at your university. Most universities, at least in the UK have this kind of service. I&E services usually face local businesses and may be able to help you identify the right company for a new REAMIT pilot test.
- Reamit Symposium in November/December 2021 will be an opportunity to recruit ideally at least one new pilot test company in Ireland.

- Personal contacts, just talking to people you know, your family, your friends about the REAMIT project.
- Approach actors that help companies to handle the waste in order for them to include REAMIT technology as one additional tool that could be combined/suggested to have even higher results. VALORIAL has contacted food waste handling companies, associations, online platforms for example.
- Communicating about REAMIT through local communication channels.
- The project also needs to communicate in German because for small companies in Germany, German is the first language. This is also a case in France. REAMIT communication team will be developing videos and cases in French and German. [NTU to check if it is possible to put a voice recording on top of the current videos, to have it in French or German. Explore if this would be financially feasible]. Translation services make use of the free translation on Google. Videos with captions written at the bottom of the video in French that can be automatically translated. VALORIAL has developed a flyer in French which explain the technology, the company, the gain for and what the get engage to when getting into a end user approach.
- More than 30 companies were contacted, most of them are afraid to explain to their customers the amount of food waste that they produce. An idea is to try to promote REAMIT in a more positive way, not only by talking about reducing food waste but also by talking about 'preventing food waste', 'being more sustainable', 'and increasing quality of food production and distribution'.

**Action: I&R, MTU and UCD to approach contact point persons for Ireland and France to recruit new Companies for new pilot tests.**

21.17.12

#### **4) COVID-19 Pilot impact assessment (Gael Maugis, I&R).**

- France: Lockdown from 3 April to 19 May 2021 (some regional lockdown had been decided in March 2021).
- The Netherlands: Lockdown from 14 December to 28 April 2021.
- Ireland: Lockdown from 26 December to 10 May 2021 restriction continues to relax.
- UK: Lockdown from 4 January to 8 March 2021 with the progressive steps to move to a normal way afterward.
- After a difficult year in 2020, the beginning of 2021 has also been impacted with the pandemic crisis (Home office, difficulties to reach end-users, etc.).

21.17.13

**5) Action plan at I&R, Valorial, MTU to recruit a pilot test company in France and Ireland, Gael Maugis I&R and Adrienne GENTIL, Valorial.**

**Action: I&R, MTU and UCD to approach the contact point person for France and Ireland (contacts available at Interreg NWE Programme website) to recruit new companies in France an IE for new pilot tests.**

**Wednesday, 7 July 2021 – Afternoon session**

**14.15 – 14.30: Work Package T1 Pilot Tests continued – recruitment of new Pilot Tests, (Chair I&R)**

21.18

### ***NTU – Glen Affric Brewery***

NTU published their wish to recruit new pilot tests on the NWE Programme website. Based on that advertisement, University of Liverpool, who are collaborating with Glen Affric Brewery, contacted Usha to join REAMIT. Glen Affric would like to reduce waste in terms of usage of barley. NTU have had multiple online meetings with the brewery and the University of Liverpool and have spoken for approximately 5 hours so far. The next stage is for Imke to go for a virtual tour of the company; however, it has been postponed due to unforeseen business demands and thus expansion of the company. This has come about due to the huge demand for alcohol due to relaxing Covid restrictions and the summer season in UK. Glen Affric now hope to conduct the virtual tour for REAMIT consortium over the summer (July – August 2021.)

**Action: Whysor to go on a virtual tour of Glen Affric and propose what sensors shall be used in this pilot test.**

### ***NTU – TTK Confectionery***

Derby and Nottinghamshire Enterprise Partnership in conjunction with Nottingham City Council released a press release at the end of last year (December 2020) advertising the REAMIT project and the desire for trial recruitment with suitable agri-food businesses. TTK Confectionery contacted NTU on the basis of this advert, who are a chocolate manufacturer based in Nottingham who supply supermarkets like ASDA and Sainsbury's. They were very much interested originally in collaborating for a pilot study, however after an initial call with SB and UR they haven't shown additional interest. SB said they are a contact she is happy to follow up with.

### ***UU – Dale Farm, NHS***

Ulster University have added a new academic to the REAMIT project, Trevor Cadden, Senior Lecturer in Supply Chain Management, to aid in the recruitment of new pilot tests in Northern Ireland. Trevor has an extensive network of contacts and has been able to assist in recruiting both Dale Farm and Knockbracken Foods (NHS) for pilots if a solvable problem can be identified.

Ulster also collaborated with Harry Hamilton from the Northern Ireland Food and Drinks Agency (NIFDA) for trial recruitment. He had also been exploring a collaboration with Dale Farm on Ulster's behalf. However, it was ultimately Trevor's contact who was utilized.

Dale Farm are a large dairy producer in Northern Ireland and produce £350 million of cheese each year. Exploratory calls are being held with Dale Farm to see if REAMIT technology could assist in reducing wastage in the cheese maturation process. James said that he intends to have follow up calls with them over the summer, and that perhaps they have not spoken to the correct person in the business thus far. James feels like Dale farm need to suggest to Ulster how technology could be utilized to reduce their waste as they are the industry experts.

**Action: Ulster to identify the right person at Dale Farm to discuss Dale Farm participation in the REAMIT pilot test focused on reducing food waste in the cheese production process.**

Knockbracken Foods prepare pre-cooked meals to the hospitals in the Belfast Trust of the NHS. One application of REAMIT temperature monitoring technology could have been in their chill room post preparation, however they have unfortunately just purchased a commercial alerting system for this. Exploratory calls are being conducted to see if REAMIT technology could be applied to provide quality assurance regarding micro-bacterial analysis in sandwiches to prove freshness, or for allergens in foods.

Ram said that the primary objective in REAMIT is utilizing temperature and humidity data and helping companies maintain these variables. Contamination (e.g., which is in the interest of NHS) is not the primary focus of the REAMIT project. A REAMIT pilot test should be related to temperature and humidity data. Most pilots in REAMIT should follow the standard architecture proposed by controlling temperature and humidity.

***Whysor – BIOGROS, Luxemburg***

Whysor approached a company in Luxemburg (BIOGROS) at the beginning of May 2021, who sell biological products to supermarkets and small village shops. They are interested in starting a pilot test, testing in trucks that transport Luxemburg goods – for example mushrooms and celery crops. They are currently having problems with too much moisture. They are also wanting to measure temperature and humidity in their warehouse as they are experiencing some issues with mold here. Whysor are hoping to meet with them again in the next few weeks.

***Whysor – Van de Huijgevoort Groep, The NL***

They are also working with a Dutch company who own 3 supermarkets in the south of the Netherlands and also a meat processing factory. There they process semi-finished produces e.g., minced meat for sausages. They mostly have microbiological issues there with salmonella etc. They are very interested in trialing the fresh detect system. Imke is hoping to meet with them next week with RR and KP, and they are very interested. The two potential pilots could both start in the next few weeks or months.

***UoN – Prince de Bretagne, France***

Prince de Bretagne are a producer of fruits and vegetables located in the north of Bretagne, France. The company packs and ships directly from the farm to consumers. They are having some issues with degradation during the transportation of broccoli and are interested in applying REAMIT technology. They are hoping to schedule the pilot for September/October 2021. AG mentioned that they have also tried to approach a lot of companies who prepare fish, meat, and vegetables, trying to reach as many end users as possible.

***BED – German trial***

KP has contacted the NWE Programme contact-point person for Germany to help with the recruitment of a German company for a REAMIT pilot test. The contact point was able to provide names of 6 agri-food companies who were approached, however unfortunately none of them followed up. Kate mentioned that the German language barrier is a big problem, as well as geographical distance. Also, they are having to use a third person to speak on their behalf.

***BED – Unilever, UK***

For Unilever, they also decided not to pursue with a REAMIT pilot test, as they do not have fresh food waste. AG told KP that due to the trace and track project she is involved in, she has contacts in Germany. She will send them on to Kate and also Imke, who speaks German.

***BED – other companies, UK***

RR said that BED is hoping to approach many companies for pilots through the Southeast Midlands Local Enterprise Partnership and invited RC from this organisation to speak (later on the day).

***UCD – update on new trials***

Xavier said there are no further leads from UCD apart from what was discussed at the morning session, but they are still planning on following up with the previously mentioned mushroom trial. The trial with Carton group has not progressed, and they have been unresponsive since they changed ownership.

21.19

**Southeast East Midlands Local Enterprise Partnership (SEMLEP) – presentation by Richard Cook (invited by BED)**

Richard Cook works for the SEMLEP who are responsible for promoting economic growth in the South-East Midlands region of the UK. Within the SEMLEP, Richard is responsible for food and drink enterprises for the region. Richard mentions that one of the most powerful things we have is the collaboration with universities – specifically BED, Cranfield, Northampton. Richard works with retailers, food manufacturers, and logistics companies. Waitrose have their largest distribution center in our patch in Milton Keynes. Richard is in frequent contact with them and said he will check with them if there's any pilot which could be explored between Waitrose and REAMIT at the next meeting.

RC mentioned that themes focused on reducing food waste appear more and more often in the press and media. The topic of food waste is linked to sustainability and reducing carbon footprint. However, food manufacturers are very busy individuals and they're only going to respond to what the consumers and government want. Hence reducing food waste needs to be presented to them in connection to improving their businesses, process, financial tables.

**13:45 - 14:15 Weather Logistics Ltd – An introduction by Dr Christopher Nankervis, CEO of Weather Logistics Ltd, UK**

21.20

Christopher Nankervis (CN) provided a presentation on the research his company, Weather Logistics Ltd, is currently completing and how it could fit under REAMIT and/or be scalable to the REAMIT project. Weather Logistics Ltd provides seasonal forecasting, i.e., climate predictions from 2 to 15 weeks in advance, which can be used in the agriculture sector to identify risks. CN has been able to provide predictions for the UK, Turkey, and Spain and is currently collaborating with the European Space Agency.

Weather Logistics Ltd provide data as a service and have a high level of technology readiness. As an example, CN mentioned that with one lettuce farm he collaborated with, they were able to reduce food wastage by £0.9 million pounds. Weather Logistics have the capability and technology to provide heatwave planning to reduce food wastage, forecasting and analysis. CN is happy to collaborate with REAMIT partners for potential weather-based food waste applications or provide additional contacts. He mentioned that risk-based decision making and scenario analyses for projections of surplus / deficits in food waste, operational adjustments to mitigate upcoming risk, and > 2-week logistics planning are the best options to explore for involvement with him.

DB asked CN if his system could accurately predict weather extremes 5 days from now. CN said that they are not focusing on short term weather predictions at present, but in terms of extremes where they are adding value is that their forecast model can predict extremes, not simply stating warmer than average.

RR said if any partner is interested in collaborating with CN, please contact him and keep RR in the loop.

**14:30 - 15:30: Work Package T2 Big Data integration and application to reduce food wastage (Chair BED)**

21.21

**Tom Verstraten (Whysor), Dashboard Development**

Tom Verstraten (TV) from Whysor showed new development progress on the REAMIT dashboard. Now, templates have been created to allow for consistent dashboard creation while also reducing the workload. They are designing a reporting tool / module, which will generate a periodic link containing a PDF which can be shared with interested stakeholders. Users can set up the reports themselves. Whysor have also added an alerting system, so you get email alerts to check the dashboard, and export the dashboard as a PDF.

Tom is currently thinking about how to display the data for the Picnic trial.

YD asked if the dashboard is limited to the Picnic trial only or if it can be used for other REAMIT pilots.

TV said that the sensor would need to be connected to their architecture - i.e., the data in their platform. Once they have been connected, the user will have access to it.

TA asked how transferable the dashboard is to the data on the big data server at BED.

TV said that for now, they are choosing a parallel approach where Whysor also warehouse the data for the visualisation. They have scripts to transfer the data from the Whysor platform to the Bedfordshire server. This is a manual process, but it has been written in such a way that it can be automated.

KP asked if there is a difference between the REAMIT dashboard and the Whysor dashboard, additionally if they are displaying raw data or cleaned data.

TV said they will schedule a follow up meeting to discuss this further.

GS asked if the dashboard cannot be connected to the BED server to visualise all data.

TV said that it would take some work to convert the data type from the BED format to their dashboard format. He said that it would certainly be doable for time series data e.g., the data which comes from the Picnic pilot, but visualisation would be more difficult for something like spectroscopy data. The dashboard was really designed for time series data, but this is something to discuss in a follow up meeting to see what the possibilities are there.

**Action: Whysor to hold a meeting on dashboard and data in Whysor cloud.**

21.22

**REAMIT App, presentation by Davinder Bola, Levstone**

DB made a presentation on behalf of Levstone giving an overview of the REAMIT phone app currently being developed. DB was able to give a live demonstration of the app in the presentation. Levstone demonstrated the app working with a temperature and humidity sensor provided by *blue maestro*, which operates on low powered Bluetooth. The cost of each sensor is approximately 50 pounds. Data recorded by the sensor on the app can either be viewed in the app itself, or the app can send the sensor recordings to the back end big data server to let the client view the data. DB mentioned that Bluetooth sensors are only useful up to 10 meters, so they may not work for larger lorries, if the mobile phone is placed in the cabine and the sensor is located at the back of the lorry. However, the blue maestro has internal storage for up to 6000 records and has an



estimate of 9 months battery life. If recordings are made once every 10 minutes, the internal storage would store 60000 records. The app could also be configured to send alerts, although this has not been implemented yet. There is currently a version of the app downloadable on the Android Play Store. TA asked what the difference was between his app and the Whysor dashboard.

DB explained that the app is used for connecting to low power Bluetooth sensors and sending this data to the cloud.

TA asked if WIFI sensors could be added to the app as well as Bluetooth sensors.

DB said that this would be possible if desired.

### **An Introduction to Data Analytics, Gautam Samriya, MTU**

21.23

GS (MTU Kerry) provided an introductory session on Data Analytics, specially aimed for partners from non-analytics background. He explained the basics and principles of a Data Analytics process, and its life cycle.

GS presented the Data Requirement and Collection in the REAMIT document. The document provided a base blueprint and reference for data requirement and data collection strategies of all the pilot tests in the REAMIT project. Apart from summarizing all the data collection needs of all the pilot tests in a single document, the aim of this activity was to brainstorm and discuss data requirements of all the pilot tests and to come up with suggestions on new and important data capturing needs for all the pilot tests in the REAMIT project.

### **Big Data Server – Presentation by Joy Eze, BED**

21.24

JE gave a presentation on behalf of Lohit to update the team on the progress on the big data server at University of Bedfordshire. Currently, the university is procuring the big data server user license. The final choice of server was made with the IT department in BED. Originally, they had checked the price of Amazon AWS / Azure cloud server, however it was found that purchasing a server was going to be much cheaper.

GT asked who would be footing the cost of the licenses.

KP confirmed it was coming out of BED's budget.

It was noted that a WP T2 meeting between the technical partners will be required.

**Action: BED to organize a technical meeting of technical partners regarding license for Big Data Hub at BED, connections to the Big Data server, etc.**

### **Third REAMIT Symposium, presentation by Shane Ward, UCD**

21.25

SW gave a presentation in relation to the third REAMIT Symposium, due to be hosted by UCD and take place in November/December 2021. SW noted that if the symposium were to happen in December it would need to be early December due to the Christmas break. Ideally, agribusiness and technology SMEs would be invited to participate in the symposium. SW proposed three options of format for the meeting. Either 1 full day, 2 full



days, or 2 half days. He also asked whether it should be virtual, hybrid, or an on-site event. How far should the net be cast? It was agreed that a specific meeting would be required to finalise the details.

RR said he would prefer the event to be in person, but we will have to see how COVID-19 restrictions are closer to the time. SW proposed 3 dates for the symposium: 2<sup>nd</sup> week of November and 1<sup>st</sup> week of December. RR said for SW to choose the 2 best days that he prefers and the rest of the REAMIT team will book it in their diary. RR said the COVID landscape of vaccine supply chains could be nice to include. What do you want to achieve from the symposium? KP says we should be able to be ambitious at the third symposium. RR mentioned that the emphasis on recruiting new companies will be less at this symposium.

**Action: UCD to organize in September an online planning meeting with BED and NTU on the 3<sup>rd</sup> REAMIT Symposium in Ireland.**

Day 2. Thursday, 8 July 2021 – Morning Session

09:00 - 10:00: WP Communication (Chair NTU)

21.26

A presentation about the Central Laser Facility in NTU was presented by AP:

- The Central laser facility hosts the most advanced lasers in the UK and the Food Network, that brings together STFC researchers and facilities research with industry in the agri-food sector in order to develop an application for sustainable production site with remote sensing techniques for the industry.
- It also provides technical application for the supply chain in manufacturing food industry and nutritional and human behavior, e.g. food fraud, packaging, waste, rerouting, by a combination of technology through the most advanced microscopy department with Raman spectroscopy.
- They are able to image and track single molecules in multiple dimensions and send them the spectroscopy to track the changing system of foods over time.
- They have collaborations with Coconut's Collaborative, PepsiCo and Syngenta.

21.27

**WP Communication meeting – presented by Prof. Usha Ramanathan and Sasha Bennett.**

- One to one interaction started, and SB is contacting the partners to create small social media news and, if possible, this can be converted as local news in local languages.
- Main objectives of WPC are:
  - (1) influence agribusinesses to decrease amount of food waste in food supply chains by 10% by 2021,
  - (2) raise awareness of the potential from combined technologies and
  - (3) convince agribusiness users of the value of REAMIT's technologies and increase knowledge.
- The role within the project is coordinating the process of designing the project's communication strategy in close cooperation with the Project Coordinator/Lead Partner and project partners.
- NTU have started to develop a storyboard, which is a collection of different stories from around the globe on actions to avoid food wastage through technology, all through social means like charities.

- Coordinating the implementation of communication activities. Managing REAMIT's web space and social media. Not only leading and posting on social media but trying to help other partners to put something new on social media. Managing the spaces and social media to make sure that at least two posts happen every week.
- Liaising with JS and lead partner on project/programme communication.
- Several ways of communication will be used in engaging the target groups:
  - Installing project banners and signboard.
  - A new, stand-alone REAMIT web page will be developed by September 2021 (domain is being transferred).
  - Creation of TV programmes. There is some funding for certain skills, especially video recording or to get some airtime on Nottingham TV station. A short 10-15-minute documentary is planned.
  - Journal articles and case studies are ongoing work.
- The Communication Strategy Document has been updated with new activities and it is available in SharePoint. Updates include:
  - New Video Production Plan for 2021.
  - Communication strategy for reaching local stakeholders across the North-West Europe region.
  - List of networking events attended from Jan-July 2021 by REAMIT colleagues.
- An overview about the REAMIT new, stand-alone website was presented:
  - Domain secured in 2019 – [www.reamit.eu](http://www.reamit.eu), redirects to main Interreg North-West Europe Programme REAMIT project page. New website will have the same domain name that we originally purchased back in 2019 just to keep it consistent.
  - New features included on the website: Sign up form for newsletters, Call to Action. When people sign up, they can automatically subscribe to any newsletters and they can sign out and also unsubscribe from any future news as well.
  - New Events and News Feature.
  - New website for REAMIT is currently being developed.
- Social Media:
  - Updates are continuing being posted on LinkedIn and Twitter (aim for at least two posts on LinkedIn and Twitter a week). A total of 110 tweets were made in this period. LinkedIn views increased by 83% in the last 6 months with an addition of 33% of unique visitors.
  - Twitter page (<https://twitter.com/reamit4nwe>).
  - LinkedIn page (<https://www.linkedin.com/company/reamit4nwe>).
- Project Banners, Posters and Flyers :
  - Promotional materials created so far: Animated Video, Roll Up Banners, updated the REAMIT brochure in February 2021; released two newsletters so far with the third newsletter on the way in July 2021; Posters; Leaflet; REAMIT partner video; infographics; and large format A2 vehicle magnets (available online).
  - New materials developed in this period (January – June 2021): (1) Two new animated videos for pilot tests (Picnic and WD Meats). These are yet to be published as we're still awaiting confirmation from Picnic; (2) New Posters have been developed (Picnic, WD Meats, IGRECA); (3) New interactive slide decks of Food waste stories have been added to the REAMIT website.

- **Policy Briefs:**
  - The objective for REAMIT communication team and PPs is to keep contacting local councils and food associations to promote and disseminate REAMIT work. E.g. SEMLEP is a local public policy organisation within South East Midlands of UK that BED is connected with, to communicate about REAMIT.
  - There are opportunities for impacting policy in the EU and in the UK, because REAMIT is looking to support policy makers to make sure that there are suitable policy mechanisms to encourage people and companies to reduce food waste. The challenge is to identify the right kind of contacts and then approach them in a proper way. Policy briefs will take time because the pilots are starting to collect data only now, and we have to produce appropriate materials and data analysis to substantiate any claims. For these reasons, the research studies and the case studies will be crucial because REAMIT is talking about policy and we are bringing out some of the new knowledge from our work and will present it to policy actors as tools to help achieve policy objectives.
  - REAMIT consortium have at least three concrete opportunities to influence three different policies:
    - The first one was mentioned by GW from the Human Milk Foundation. She works on designing human milk banks in Europe and has access to ministries, etc.
    - The second entry point to policy was mentioned by Yumchop, because they have to follow some rules, governmental rules to make sure that they check the temperatures in the morning and in the evening. There is an opportunity to influence or propose a solution, which includes this kind of policy to monitor temperature in which food is stored.
    - Third one is through RC of SEMLEP. He can be an entry point for REAMIT to national policy level in the UK. In his role, he is based between the national and regional policy levels.
  - The next step is to identify the local and national policy-makers and stakeholders within the North West Europe region to disseminate information about REAMIT approach.
  - From the experience from other projects, the approach for local policy level is to contact policy makers and they can inform if the technology can be adapted to the local council.
- **Report on REAMIT Networking Events:**
  - It has been difficult to attend physical events, but partners attended 2 Interreg North-West Europe Networking events in 2021. UR presented in May and SB presented in June. Many food organisations on board who are seeking solutions for waste. Attended by many Interreg projects linked with low carbon and resource efficiency themes.
  - REAMIT Networking Events reports have been presented in Newsletters, this is also reported to JS through REAMIT project report.
  - REAMIT is presenting regularly in external academic and practitioner events. This is reported in CS document and social media.
- **Articles and Case Studies:**
  - Case Studies are being developed for pilot-tests: WD Meats (UK), Picnic (NL), Human Milk Foundation, Yumchop, Routhiau in France (UoN).

- Book chapter was submitted for publication and two more conference papers have been submitted and will be presented in the next few months.
- Data analysis papers will be ready once the data is analysed.
- REAMIT Website Updates:
  - New section on impact of COVID-19 on food waste and food supply chains
  - Call to action: Newsletter subscription sign-up form.
  - Link to Mailchimp newsletters that takes the users to the most current newsletter. The July 2021 newsletter will be ready in July 2021 featured on the Mailchimp service.
  - New website for REAMIT currently being developed.
  - The changes on the REAMIT website were presented, such as the tabs on the website were re-arranged, news and events featured on the homepage, subscription session, etc.
- Update on Newsletters & Videos
  - Sharing social media database among partners, which is a list of all of the partners social media, twitter and account details.
  - 3 newsletters have been prepared so far in 2021: February 2021, April 2021 and July 2021 newsletters. Urge for partners to promote REAMIT Newsletters regularly. Partners could share it amongst their networks and email it to their stakeholders and other partners and associated partners, to policyholders and various target groups.
  - New Mailchimp platform, which is where the newsletters were developed, and it is an easier and much more automated service rather than the kind of manual creation that was used before.
  - 2 new videos created on pilot tests with Picnic and WD Meats and more videos in the pipeline- HMF, Yumchop, and Routhiau.
- Communicating through local communication channels:
  - Active participation is encouraged through supportive approach of production of short news to actively communicate about REAMIT to their local stakeholders through local channels and online networks - NTU contacted partners individually. All the partners have the responsibility to communicate through social media.
  - Communication template has been created and sent to partners to help create social media posts.
  - University of Nantes, Valorial, Images & Reseaux, University of Bedfordshire, Nottingham Trent University and Ulster University have made active communication actions – Other partners are requested to join this initiative of communication.

**Actions: Each partner to develop at least one piece of news about REAMIT to be communicated in social media. This can be converted as local news in local languages.**

**Action: NTU to have one-to-one interactions with PPs to assist with creating small social media local news.**

**Action: NTU to finalize a storyboard, which is a collection of different stories from around the globe on actions to avoid food wastage through technology, all through social means like charities.**

**Action: NTU to develop a new, stand-alone REAMIT web page and send it to PPs for feedback.**

**Action: PPs to identify the local and national policy-makers and stakeholders within the North West Europe region to whom they will disseminate information about REAMIT approach.**

## **10.00 – 10.15: Status of REAMIT project 12-month extension (Chair BED)**

21.28

Based on input from PPs, BED developed the REAMIT 12-month extension budget proposal. On 12 May 2021 it was sent to JS for initial feedback. JS requested formal approval at BED and it is currently in approval flow at BED.

**Action: BED to finalize the paperwork related to the approval of REAMIT project 12-months extension budget.**

## **10:30 - 12:00: REAMIT Steering Committee (RSC) meeting**

21.29.01

- The minutes of 4<sup>th</sup> RSC meeting (20 – 21 January 2021) were presented, agreed and considered as final (approved) by the whole partnership present in the meeting.
- The action log (as part of the minutes) was reviewed, updated and approved.
- Feedback from RAC meeting and the decisions of the WP meetings will be discussed and approved after discussion.
- Some feedback was received from East Netherlands Development Agency, but not from the other associate partners. There are two companies listed as associate partners at Ulster University (e.g. Biosensor is an associated partner of UU). UU partners were asked to talk to the associated partners, get their feedback on REAMIT 5<sup>th</sup> progress report and share it with BED.

**Action: Ulster to get feedback from associated partners on 5<sup>th</sup> REAMIT progress report and share it with BED.**

- Regarding WP T1, the consortium is still looking for more pilot test companies, while hoping for the pandemic to end.
- Regarding WPT 2, three critical activities are: (1) purchasing the additional licenses, (2) providing access to all partners to big data hub (and any other installation related activity related to the big data server), and (3) completion of the mobile app development.
- Regarding WP C, the main takeaways are: to address language related challenges when producing REAMIT communication materials; refocusing the messages in REAMIT communication materials and channels (i.e. rather than 'reducing food wastage', we should talk about 'sustainability, avoiding food wastage, improving company's processes, quality of production lane', etc.).
- Regarding WP M: Revision of REAMIT risk log based on new risks identified in the REAMIT project.

## **Revision of REAMIT risk log**

21.29.02

*(1) Risk of not having a pilot test in Germany due to losing Weyers and no success in recruiting a new company in Germany (high risk).*

How to address this risk? Developing some communication materials in German language will make it possible to reach out to some potential companies in Germany. It is important to produce at least one video and one

player information in the German language. Whysor offered help in translating text to German and liaising with GIQS (national contact point for Germany).

**Action: NTU to develop communication materials about REAMIT in German language with Whysor's help regarding translation.**

**Action: Whysor to liaise with GIQS (national contact point for Germany) about new companies in Germany for REAMIT pilot tests.**

*(2) Absence of a proper French pilot test and an Irish pilot test (high/medium risk)*

How to address this risk? Developing communication materials in French language (e.g. one short video about pilot tests in the REAMIT project) would be helpful.

**Action: NTU to develop communication materials in French language i.e. one short video about pilot tests in the REAMIT project will be in French, with support from I&R, Valorial and UoN.**

**Action: UCD and MTU keep making efforts to recruit new companies in Ireland.**

French partners are very focused on Raman spectroscopy; however it would be important to have other types of traditional sensors, i.e. temperature and humidity sensors piloted in France as well.

GM advised that Prince de Bretagne are not interested in traditional sensors, and they want Raman Spectroscopy only. According to GM, Raman Spectroscopy has added value for the REAMIT project.

Ram suggested exploring whether Prince de Bretagne would be keen to connect their sensors to the REAMIT cloud, allowing REAMIT analytics team perform data analytics and come up with the alerting system.

**Action: I&R to ask Prince de Bretagne if they are keen to connect their sensors to the REAMIT cloud and obtain from the REAMIT consortium an alerting system for this data.**

*(3) The sensors cannot be fitted at Yumchop and HMF by Whysor physically due to travel restrictions (High risk)*

There are travel restrictions in the UK and in The Netherlands (summer 2021) because COVID infections are rising again. Whysor partners have tried to find somebody with experience in sending goods to the UK using LinkedIn, but no answers so far. How to address this risk?

**Action: BED to support Whysor with sending sensors to Yumchop and HMF in the UK.**

**Action: Whysor to provide online support for fitting sensors at Yumchop and HMF.**

**Action: Levstone to support Yumchop and HMF physically with fitting the sensors.**

*(4) Risk for sending the sensors by post from Whysor to Yumchop and HMF (High/medium risk).*

BED will explore sending sensors with another courier.

*(5) Risk for less effective communication if pilot test partner companies insist on remaining anonymous in REAMIT communication activities (low risk).*

*(6) Risk of further delay in WP T1 implementation due to the lengthy procurement process at BED (low risk).*

Other risks:

(7) IH raised concern that delaying the payment from LP to PPs is a big issue for small companies who are forced to wait for money for 7 months. Whysor are still waiting for the payment for the work completed in 2020.

RR confirmed that he had talked to the finance department at BED several times that partners in REAMIT should receive the funds from the funder without delays.

21.29.03

**5<sup>th</sup> REAMIT project activity and finance report and payment claim (January – June 2021) calendar.**

KP presented the calendar for REAMIT 5<sup>th</sup> progress report:

- By 18 June 2021: Each partner has developed their activity report in eMS and shared (as a PDF file) with all REAMIT partners.
- By 13 August 2021: each partner has finalised in eMS their FLC audit and submitted to the Lead Partner the certified activity and finance report, payment claim and forecast of expenditure for the next period.
- Evidence of deliverables. All partners were asked to upload evidence of deliverables in EMS.
- It is important to pay attention to the section about target groups.
- FLC audit: partners should have agreed by now the time of FLC audit of each partner's progress and finance report. It takes 3-4 weeks for an auditor to complete an audit of a partner's report.

21.29.03

**Plans for the 6th meeting of RAC/WP/RSC: 19 – 20 January 2022, to be hosted by Ulster University, Joan Condell and James Gillespie, Ulster.**

- Virtual or physical event? Ulster University is very much risk averse, and at present are not allowing staff to travel, even to the UK. However, in person teaching resumes in September 2021 and university travel restrictions may be revised then. The COVID situation will need to be monitored as many partners will be travelling from mainland Europe, where quarantining upon arrival may be a stipulation.
- Ulster University is planning a meeting in late September to decide about the format of the 6th meeting of RAC/WP/RSC. James will organise this with Joan and the BED teams.
- The idea is to plan a hybrid event, hosted online but also hosting some people if the situation allows. Ram's preference is to have the session as a face-to-face event if possible, but we will have to plan for both.

**Action: Ulster to decide about the format of the RAC/WP/RSC meeting in January 2022 and communicate it to PPs.**

21.30

**12:00 - 12:30: WP T3 Business development of REAMIT technologies (Chair Ulster University)**

- Review (mapping) of the technical and business landscape in the fresh produce food chain (JG of Ulster and TC of UCD).
- The timeframe for this deliverable was originally January 2021, but since REAMIT received a one-year project extension, the new delivery date for the work is now September 2022.



- The output expected is one assessment report that will be an internal document for partners used as the basis for the business model development.
- The actions in progress included the establishment of networking activities with other partners. During the WP T3 meeting in the beginning of May 2021, it was suggested to start planning this review and the topics that should be included in the report.
- UCD started collecting data about the topics suggested during the meeting that include: (1) methodologies for food waste accounting; (2) where in the supply chain it becomes waste, (3) information on the amount of waste generated in different supply chains.
- A literature review is being performed for food waste accounting, which has found that 42% of food waste in supply chains come from fruit and vegetables. However, this is an indirect type of data collection which has much higher uncertainties with respect to accuracy compared to direct methods of data collection e.g. surveys / questionnaires with companies.
- Ulster started planning the collection of data about technical and business landscape. They proposed using a standardised questionnaire to survey companies that are already involved in the REAMIT project in the first instance (e.g. Yumchop, HMF, WD Meats) to collect consistent information about the technology and current business landscape. This will allow for grouping and analysis going forward. Proposed information to collect is as follows:
  - o estimate of current food waste;
  - o the main suspected causes of food waste;
  - o what approaches are taken to try to reduce/handle this waste;
  - o technology solutions to try to reduce food waste;
  - o awareness of any technology solutions which could be applied.

RR proposed that these questions are appended to the case study questions that we are going to approach pilot test companies with and has proposed that UU works with BED and NTU to develop the questionnaire further. RR said we should not approach pilot test companies individually, but rather as a group and we will select the most relevant person for this task given the pilot test company that is involved. YD agreed with RR and mentioned that as we only have a limited number of case study companies, we need to ensure a coordinated approach is used when conducting a survey otherwise they may get annoyed being approached multiple times. Also, perhaps we could rephrase the questions in a more positive way as 'waste' is a negative word which companies may not like to use. How about 'potential' or 'how to avoid'. RR said please send questions to NTU as they are leading on the case studies and let them coordinate it, but JG , TC, XC, and GS will be contributing as they are involved in the case study too. UR mentions that these questions may not suit all companies, for example WD Meats. She proposes that the questions could be customized for each case given the pilot study. RR said we will need more meetings to ensure they are all exhaustive and appropriate. YD is extremely knowledgeable in these types of questionnaires and we should make use of her expertise.

- The Potential Sensor Technology for Continuous Monitoring of Food Quality in Transport report may overlap in some points with this deliverable. It is important to define the boundaries of this review in order not to overlap with the work already made.
- The plans for the second semester include: (1) the enlargement of networking activities with companies, in order to collect the data about their technical and business activities; (2) the production of a questionnaire to collect direct data from the companies; (3) start collecting data from the



companies; (4) assessment of the economic impacts of food waste produced and the economic savings of food waste avoided that are expected by implementing the REAMIT technologies.

- The actions to collaborate include meetings between UCD and UU to start working on the questionnaire and the data collection.

**Actions: Partners involved in case study development, to collect information from pilot test companies on their technical and business activities.**

21.31

#### **Life Cycle Assessment for REAMIT (Tamiris da Costa, UCD)**

- The output expected is the life cycle assessment of the strategies implemented by the REAMIT project, which will allow the study of the environmental impacts and savings of the pilots.
- The life cycle assessment is the evaluation of the potential environmental impacts of a product through its life cycle, starting with the food production until the end-of-life.
- In the LCA task, it will be provided an estimation of the potential environmental impacts and environmental savings related to the strategies implemented in each pilot to reduce food waste.
- The actions in progress included the review about the LCA studies related to food waste. The establishment of networking activities with other partners, in order to understand what is being proposed in each pilot test and to define the data requirements for the LCA.
- The goal and scope of the LCA, include the definition of the objectives, the functional unit, the scope and the system boundaries. The objective of this assessment will be to identify the process that affects the environmental performance of the pilots in terms of the carbon footprint.
- As each pilot will be implemented in one stage of the supply chain per time, the scope of the study is a gate-to-gate, which means a partial LCA that looks at only one process in the entire production chain.
- The system boundaries of the pilots involved in the REAMIT project were presented. In food production, the system boundary includes the energy consumption, the raw materials (in this case, fertilizers, etc.), the wastes (wastewater, solid wastes, food waste), the pilots and the big data platform that will be used to reduce the problem with the food waste.
- The data requirements were grouped into five questionnaires organized according to each stage of the food supply chain that the pilots can be implemented: food production (Agri and animal origin), manufacturing, storing, distribution and retail. Part of the questionnaire will be completed by the pilot leaders, but information from companies is also required.
- One example of a questionnaire and the data needed for the distribution stage were presented, but the questionnaires are general, and they will be adapted to each pilot.
- The plans for the second semester include: (1) enlargement of the activities with other project partners; (2) individual meetings with each pilot leader, since the LCA must be adapted for each type of case; (3) start collecting data from the companies and pilot tests after data compilation in WP T1 and WP T2.
- Individual sessions will be important to provide further guidance to complete the questionnaires.
- LCA work relies on data from pilot tests, case studies etc. Obtaining data is crucial to complete the LCA.

- Ram said a similar coordinated approach will be required for the LCA when approaching potential companies. Kate raised a concern that the questionnaire is asking a lot of questions, more than what some pilot companies may either know or be willing to share. TC said that the first preference is collecting primary data from the companies, but if we aren't able to do that we can try to find the data in the literature or databases. Ram said we have to start with the companies in the first instance, then we can use other means to fill in the blanks. LCA will help show that the use of technology is going to help reduce food waste.

**Action: UCD to define the data requirements for the LCA for each REAMIT pilot.**

**Action: UCD to hold individual meetings with each pilot leader, since the LCA must be adapted for each type of case.**

**Action: UCD to start collecting data from the companies and pilot tests after data compilation in WP T1 and WP T2.**

Day 2. Thursday, 8 July 2021 – Afternoon Session

**13:00 - 13:45: Research studies from the REAMIT project (Chair BED)**

21.32.01

**Presentation by Prof. Ram Ramanathan – ongoing research studies on the REAMIT project at BED**

**1<sup>st</sup> study**

- An optimisation model for cost effective integration of transportation network design with quality control to reduce fresh food wastage.
- Authors: Lohitaksha M. Maiyar, Ramakrishnan Ramanathan.
- The goal behind this study is to find out what are the incentives for companies to use REAMIT technologies, under what conditions they will prefer to use REAMIT approach and technologies.
- Problem environment: companies may choose from one of the following for transporting their goods, depending on the type of food, distance, but also because they may not be able to make the investment:
  - a) Vans with no temperature control – cheapest option (excluding cost associated with waste).
  - b) Vans with temperature control but no monitoring (more common in Europe) – companies would look at the temperature records at later stages to make sure there was nothing wrong, but no continuous monitoring of the temperature.
  - c) Vans with temperature control and monitoring – REAMIT idea.
- The study assesses what conditions will make companies choose among these options.
- A factor is the cost or investment, temperature control and monitoring increase the cost. Companies may not choose the third option if they cannot afford it. The cost of transportation depends on distance, but also there is a cost arising from the food that becomes waste during transportation. On average 15 to 30% of the food is lost if there is no temperature control. The third option is the most expensive initially, however, given that cost of wastage will be notably reduced, this will average out the cost of fitting for monitoring and control technologies.
- Although this is not a completed work, Lohitaksha performed some mathematical modelling.

- A first modeling approach showed a model (objective function: minimise transportation and food wastage cost) had several input parameters (e.g.: distance between farms and demand points) and outputs (e.g.: food waste reduced).

## 2<sup>nd</sup> study

- A theoretical sustainability model on using IoT sensors and cloud systems for reducing food waste and emissions in the fresh food sector.
- Authors: Lohitaksha M Maiyar, Ramakrishnan Ramanathan and Lakshmi Swamy.
- This study was accepted for presentation at the logistics research network conference (to be held at a later stage in 2021).
- The framework/modeling that was used for this study was a requirements-technology fit model. The objective of using this framework was to assess the impact on food waste and emission reduction of the technologies employed. The model takes into consideration the fit or matching level between technologies and the tasks requirements - the problem that needs to be solved - for example, in order to achieve food waste or emissions reduction, we need to engage in appropriate technology, i.e.: IoT sensors with the correct characteristics.
- Task requirements refer to the problem, which is trying to be mitigated, the situation that technology can help solve.
- **Example in the REAMIT context:** food waste in the supply chain can be saved to some extent with the help of technology - IoT sensors.
- The technology and task requirements need to match, that is the “Requirements Technology Fit”. This matching level or fit can be measured/evaluated, and with these prerequisites food waste and emission reduction can be achieved.
- **Future work:** survey/questionnaire in order to collect data and validate the model.

## 3<sup>rd</sup> study

- Fighting Food waste: How can artificial intelligence and analytics help? Authors: Lohitaksha M Maiyar, Ramakrishnan Ramanathan and Lakshmi Swamy.
- This work consisted of a considerable amount of literature review, which was carried out to give a comprehensive overview on analytical techniques that can be used related to food waste.
- There are different criteria for using different artificial intelligence or technologies. Three categories: cost, quality and external environment.
- A detailed mapping of data analytics techniques was developed, showing which techniques can be used under specific circumstances.
- This is a work that has not been completed, Prof. Ram welcomed people to participate/contribute to this work.

## 4<sup>th</sup> study

- Data envelopment analysis (DEA)
- This study focuses on the possibilities of using the analytics methodology DEA, a mathematical method based on an application of linear programming.
- Traditionally, DEA has been used for comparing/assessing the performances of colleges, schools, banks, firms, etc.

- Companies/organisations produce many items (similar items as those companies of the same sector), and they consume many resources. Assessing the level of resource consumption and outputs produced, it can be evaluated which one of them is more efficient in their production. In other words, it is a performance measurement technique.
- The goal of this study is to determine the scope for applying DEA in REAMIT, especially for reducing food waste. The greatest opportunity for the REAMIT team is linking DEA with life-cycle assessment (LCA). The reason is that LCA produces a set of relevant data that can be used to benchmark a set of products, once the data of LCA has been collected, DEA can then be used to identify outputs and compare performances - DEA is used to rank agribusinesses/farms.
- Large scope for more DEA studies.
- To date, no DEA studies applied to food waste.
- As an example, prof. Ram showed previous work that he carried out which involved LCA calculations to determine carbon footprint for producing various fruits and vegetables. Once LCA calculations have been performed, then DEA can be used to rank agribusinesses/farms in the scope of food waste reduction, emission reduction, and so on.

#### Q&A

UR: Two of my students and I are working on sustainable impact assessment and LCA. If any assistance is needed, the NTU team is happy to assist.

RR: Expecting NTU to lead in the case studies.

UR: Another point is not to forget to mention that people writing case studies will be credited for the work.

RR: Any updates on the paper sensor technology for maximising quality and minimising waste?

JG: No updates on the publication. The paper was resubmitted to another journal, the Irish sensors journal. 21.12.02

#### **Presentation by Ali Assaf – Raman spectroscopy, pilot with Routhiau (France)**

- The main points the presentation will cover are:
  - Research work carried out on chicken samples, available data
  - Integration in a transportable cooling enclosure
- Raman spectroscopy works with a spectrometer and a laser source. This light source is focused onto the sample; Raman is based on the interaction between light and matter. A fraction of the light is then captured by the spectrometer and Raman spectra are obtained. These spectra contain molecular information about the chemical composition of the samples.
- Need to perform statistical analysis to explore the data and present results in an easier, understandable way.
- Experiments comprised 30 trays of chicken. 1 tray was measured per day, measuring three different pieces of chicken with Raman. To have a representative measurement, various points on the chicken sample surface were analysed (approx. 50 spectra per chicken piece).
- Experiments were carried out for 30 days. Temperature chicken was stored at was not constant throughout the study: from D0 to D8, 4 °C; from D8 to D30, 8 °C. The reason was to match the life

cycle of chicken being transported, stored, etc. Also, at day 20, chicken was kept at 20 degrees for 2 hours to simulate a disruption of the cold chain.

- Alongside Raman, microbiological (total flora and lactic bacteria) and physicochemical (temperature and pH) analyses were performed.
- Each day, a Raman spectrum was obtained (an average of the 50 measurements).
- Since it is difficult to visually identify the differences between spectra, statistical analysis was performed to quantify this difference and predict the quality of samples.
- Principal component analysis (PCA) was performed to explore the data. Results showed some different groups, or different aggregation of days. Analysing the loadings of PCA, it was observed that protein and lipid bands were responsible for the variation in the spectra.
- Models for chicken quality were developed. A model that could give a number to the quality, or similarity/correlation to the chicken sample of reference (D0). Three categories were established: very good, good and “to check”.
- Results showed that until day 25, quality was very good (equal or above 95% correlation). A decrease of correlation was observed for days 26 to 29. Day 30 fell under the category of must be checked and may not be good for consumption.
- Raman results were compared to those of microbiological and physicochemical traditional methods that were also performed. Results were in line with those of Raman. E.g.: from day 20 a large number of bacteria was observed.
- Overview, status of the pilot:
  - Step 1: Lab development. Task completed.
  - Step 2: Transition between lab and truck. Ongoing.
  - Step 3: Test in real conditions. To be started.
- Challenge: to adapt/simplify the analyses so that they can be carried out by unqualified users.
- Work was carried out to determine how to analyse chicken samples that are packages with plastic film and to account for the optical signal of plastic.
- Work was carried out to establish the best areas within the chicken samples to get analysis from, getting a score that determines if the signal was correct or poor.

#### Q & A

KP: What are you going to discuss in the meeting that you are going to have with Routhiau tomorrow, step 1 or step 2?

AA: In the meeting, the following will be discussed:

1. Validate the performance of the spectrometer.
2. Implementation of step 3, the integration of the spectrometer in real conditions (step 2 will be skipped for the time being).

21.32.03

#### Research work at Ulster University – James Gillespie

- UU worked on a paper, which was written last year, but got rejected by the journal. Since then, it has been resubmitted for publication to another journal.

- For further research studies, UU will wait until more results are obtained.

**13:45 - 14:15: WP Project Management (Chair BED)**

21.33

This section was skipped because Kate had already covered it in previous presentations.

**14:15 - 14:45 WP Long Term (Chair BED)**

**Case studies with Yumchop and Human Milk Foundation – presentation by Xavier Cama, Tamiris Da Costa and Gautam Samriya.**

21.34

- Activities in progress: initial meeting with BED and NTU; meetings amongst the three staff members working on the case studies; organisation of the work.
- Work carried out to date was organised into the different sections:
- Introduction
  - Problem with food waste
  - Gap in the present state of the art
  - Goals
- Company background
  - Financial
  - Organisational
  - Marketing
  - Technology
- History and product portfolio of the company
- Solution
  - Explain the new technology/idea being proposed
- To date, work has been conducted obtaining information that is available on the internet. Future work may include obtaining information directly from the company or project partners that, due to contact with them, have relevant information.
- An overview of the first section was presented introducing the companies/organisation Yumchop and HMF, but also the problem with food waste (economical, environmental, social costs) and the solution with digital tools – where REAMIT comes in.
- Future activities will include developing further the cases studies, their planning, objectives, section organisation, but also, collecting data from the company as well as results relevant to the pilot test is expected to take place in the near future.

**Q&A**

RR suggested having a common structure for all the case studies, although he acknowledged, different case studies may have different structures as per the case study needs.

RR suggested XC and team prepare questionnaires for the pilot test companies as a future activity, to collect data from them.

RR advised the team preparing case studies to be ready to expand the case study activity for other pilot test companies (WD Meats, Picnic), although for now the work should be focused on HMF and Yumchop.

KP suggested considering the policy impact in preparing the case studies by including another bullet in the company background section that addresses the legal framework/requirements.

RR highlighted that policy considerations can be different for a company view as compared to the government view.

UR and the team preparing the case studies to meet the following week to discuss the progress and next steps.

**Action: Case study team to develop a common structure for collecting information for all the case studies, although it may be necessary to have different structures as per the case study needs. Case study team to also develop a questionnaire for the pilot test companies, to collect data from them.**

**Action log resulting from RAC/WP/RSC meeting, 7-8 July 2021**

<b>Date</b>	<b>Minute/ Item</b>	<b>Action identified</b>	<b>Responsibility</b>	<b>Update: Confirmation of completion or reasons for non- completion</b>
21/07/07	21.16.01	As REAMIT is still recruiting companies, all partners have been encouraged to keep approaching companies for pilot tests.	AI PPs	completed
21/07/07	21.17.01	Each pilot test lead to develop a user manual for each pilot test. A user manual for each pilot test shall document the experience of the pilot test and a step-by-step guide of good practice in each pilot test.	Each pilot test lead	Link with WP T1 meeting. A template will be circulated by RR. Ongoing.
21/07/07	21.17.01	Each pilot test lead to write a report on the pilot test and development of the sensor prototype.  The report will describe in detail the experiences with the pilot test and give recommendations for future pilot tests.	Each pilot test lead	Ongoing. RR will send templates for Yumchop and HMF.
21/07/07	21.17.02	UCD to report the results of the first stage (prove the concept carried out in July-August 2021) of the pilot test in Ireland inspired by Freshbox.	UCD	Discussed on 19/1/2022. Ongoing.
21/07/07	21.17.02	UCD to approach min 10 companies in agri-food supply chains in Ireland to demonstrate the tests inspired by Freshbox idea, to encourage their participation in REAMIT pilot tests. To do this, UCD may ask for help Innovation & Enterprise service at	UCD	22 companies approached. More are being contacted for a pilot test.



		UCD, Interreg NWE Programme Contact Point person for Ireland or Enterprise Ireland (or equivalent services).		Completed.
21/07/07	21.17.03	UoN to move the Raman spectroscopy pilot test to the next phase – transition from the lab experiment to the real conditions in the food trucks (Scheduled on 9 July 2021). This includes renting a truck.	UoN	Ongoing. Last stage of transition. Will be completed in 2 months. Routhiu's truck will be used.
21/07/07	21.17.03	UoN to confirm whether IGRECA and Prince de Bretagne will participate in the pilot test with Raman Spectroscopy.	UoN	Not participating.
21/07/07	21.17.04	Whysor to assist online with installation of sensors at HMF.	Whysor	Complete
21/07/07	21.17.04	BED to obtain from HMF images and videos documenting installation of sensors at HMF, for the purpose of developing Reamit communication materials.	BED	Completed. Videos have been requested.
21/07/07	21.17.05	Whysor to confirm whether sensors installed in Picnic's trucks will be re-programmed to also collect correct data on shock detection.	Whysor	Ongoing
21/07/07	21.17.06	Ulster to obtain from Marc at WD Meats information about weight of carcass before entering dry aging chamber and when leaving dry aging chamber.	Ulster	Completed.

21/07/07	21.17.06	Ulster to specify what lessons have been learnt from the first pilot test with dry aging chamber, discuss it with WD Meats and based on it propose how the second pilot test in dry aging chamber will be run.	Ulster	Completed.
21/07/07	21.17.06	Ulster to run a second pilot test in dry aging chamber (for another 3 weeks).	Ulster	Completed.
21/07/07	21.17.07	Ulster to purchase DNA extraction kit required to process the frozen swabs from WD Meats.	Ulster	Completed.
21/07/07	21.17.07	Ulster to get an update internally when a new machine will be purchased and when swabs from WD Meats can be analysed.	Ulster	Completed.
21/07/07	21.17.07	Ulster to analyse swabs from WD Meats.	Ulster	Ongoing.
21/07/07	21.17.08	Since James and Xavier expressed interest in working closely on developing this pilot test, they are requested to develop a plan of actions to take this pilot test forward. Ulster and UCD to develop a plan of actions to take 3D Fluorescence pilot test forward.	Ulster and UCD	Ongoing.
21/07/07	21.17.09	Ulster to work with Whysor to specify which sensors to be installed in Musgrave vans.	Ulster and Whysor	Completed.
21/07/07	21.17.09	Ulster to install sensors within Musgrave vans.	Ulster	Ongoing. – Next week.

21/07/07	21.17.09	Ulster to develop an android app required to handle data from the sensors in Musgrave pilot test. Application will need to be tested prior to deployment.	Ulster	Completed.
21/07/07	21.17.10	BED and Whysor to support Yumchop online with installation of sensors and connection to the cloud.	BED and Whysor	Completed
21/07/07	21.17.13	I&R and MTU to approach contact point person for France and Ireland to recruit new companies for pilot tests.	I&R, MTU	Ongoing for France. Completed for Ireland.
21/07/07	21.18	Whysor to go on a virtual tour of Glen Affric and propose what sensors shall be used in this pilot test.	Whysor	Completed.
21/07/07	21.18	Ulster to identify the right person at Dale Farm to discuss Dale Farm participation in the REAMIT pilot test focused on reducing food waste in the cheese production process.	Ulster	Ongoing.
21/07/07	21.21	Whysor to hold a meeting on dashboard and data in Whysor cloud.	Whysor	Completed.
21/07/07	21.24	BED to organize a technical meeting of technical partners regarding license for Big Data Hub at BED, connections to the Big Data server, etc.	BED	Ongoing
21/07/07	21.25	UCD to organize in September an online planning meeting with BED and NTU on the 3 <sup>rd</sup> REAMIT Symposium in Ireland.	UCD	Completed.

21/07/08	21.27	Each partner to develop at least one piece of news about REAMIT to be communicated in social media. This can be converted as local news in local languages.	Each PP	Completed.
21/07/08	21.27	NTU to have one-to-one interactions with PPs to assist with creating small social media local news.	NTU	Completed.
21/07/08	21.27	NTU to finalize a storyboard, which is a collection of different stories from around the globe on actions to avoid food wastage through technology, all through social means like charities.	NTU	Completed.
21/07/08	21.27	NTU to develop a new, stand-alone REAMIT web page and send it to PPs for feedback.	NTU	Completed.
21/07/08	21.27	PPs to identify the local and national policy-makers and stakeholders within the North West Europe region to whom they will disseminate information about REAMIT approach.	PPs	NTU, Whysor, BED have contacted. Ongoing.  A dedicated workshop with policy makers. Or, target the next symposium on policy makers.
21/07/08	21.28	BED to finalize the paperwork related to the approval of REAMIT project 12-months extension budget.	BED	Completed.
21/07/08	21.29.01	Ulster to get feedback from associated partners on 5 <sup>th</sup> REAMIT progress report and share it with BED.	Ulster	Ongoing.

21/07/08	21.29.02	NTU to develop communication materials about REAMIT in German language with Whysor's help regarding translation.	NTU	Ongoing.
21/07/08	21.29.02	Whysor to liaise with GIQS (national contact point for Germany) about new companies in Germany for REAMIT pilot tests.	Whysor	Completed.
21/07/08	21.29.02	NTU to develop communication materials in French language i.e. one short video about pilot tests in the REAMIT project will be in French, with support from I&R, Valorial and UoN.	NTU	Completed. Video will be ongoing.
21/07/08	21.29.02	UCD and MTU keep making efforts to recruit new companies in Ireland.	UCD and MTU	Ongoing.
21/07/08	21.29.02	I&R to ask Prince de Bretagne if they are keen to connect their sensors to the REAMIT cloud and obtain from the REAMIT consortium an alerting system for this data.	I&R	Completed.
21/07/08	21.29.02	BED to support Whysor with sending sensors to Yumchop and HMF in the UK.	BED	Completed
21/07/08	21.29.02	Whysor to provide online support for fitting sensors at Yumchop and HMF.	Whysor	Completed
21/07/08	21.29.02	Levstone to support Yumchop and HMF physically with fitting the sensors.	Levstone	Not needed.

21/07/08	21.29.03	Ulster to decide about the format of the RAC/WP/RSC meeting in January 2022 and communicate it to PPs.	Ulster	Completed.
21/07/08	21.30	Partners involved in case study development, to collect information from pilot test companies on their technical and business activities.	UCD, Ulster, MTU, BED	Ongoing. NTU will also be involved.
21/07/08	21.31	UCD to define the data requirements for the LCA for each REAMIT pilot.	UCD	Ongoing.
21/07/08	21.31	UCD to hold individual meetings with each pilot leader, since the LCA must be adapted for each type of case.	UCD	Ongoing.
21/07/08	21.31	UCD to start collecting data from the companies and pilot tests after data compilation in WP T1 and WP T2.	UCD	Ongoing.
21/07/08	21.34	Case study team to develop a common structure for collecting information for all the case studies, although it may be necessary to have different structures as per the case study needs. Case study team to also develop a questionnaire for the pilot test companies, to collect data from them.	Case study team: UCD, Ulster, MTU, NTU, BED.	The case study on Yumchop is likely to be completed first and can form a reference point.

## APPROVED MINUTES FROM REAMIT ADVISORY COMMITTEE, WORK PACKAGES AND STEERING COMMITTEE MEETING, 06-07 JULY 2022

Hybrid meeting hosted by Whysor  
 Venue: Brightlands Campus Greenport Venlo Address: Villafloraweg 1, 5928 SZ Venlo, The NL  
 Building: Villa Flora Room: Inspiration Room  
 Teams online meeting room hosted by Whysor

Attendees present:

Name	Institution	Name	Institution
Ram Ramanathan (RR)	Essex	Jean-Charles Vialatte (JV)	SenX
Katarzyna Pelc (KP)	BED	Fionnuala Murphy (FM)	UCD
Yanqing Duan (YD)	BED	Shane Ward (SW)	UCD
Tahmina Ajmal (TA)	BED	Tamiris Da Costa (TC)	UCD
Sahar Ahmadzadeh (SA)	BED	Xavier Cama (XC)	UCD
		Ali Assaf (AA)	UoN
Gael Maugis (GM)	I&R	James Gillespie (JG)	UU
Gladys Gallott (GG)	I&R	James Dooley (JD)	UU
Davinder Bola (DB)	Levstone	Imke Hermens (IH)	Whysor

Gautam Samriya (GS)	MTU	Tom Verstraten (TV)	Whysor
Usha Ramanathan (UR)	NTU		
Sasha Bennett (SB)	NTU		
Adrienne Gentil (AG)	Valorial		

Day 1. Wednesday 6<sup>th</sup> July 2022 – Morning Session

**09:00 - 09:05: Welcome to REAMIT meetings (Chair BED)**

RR thanked all partners for their contribution to the project over the previous period. RR asked to have updates of WP Communication package in place of report by BED, as KP would join around noon (due to unexpected family circumstances – an ill child).

22.14

**09:05: REAMIT Advisory Committee (RAC) meeting**

- **REAMIT project progress (presentation by BED)**

So far there were no comments from RAC on the progress of the project. RR mentioned that although it is a good sign, it would have been helpful to receive feedback, suggestions as well as compliments from Advisory Committee members.

RR asked if KP had prepared the lead partner progress report covering January – June 2022, which would summarise each partner's progress so far. KP said that she has not had a chance to prepare the overall report yet as some partners submitted their report late, while others still have to submit it. Also, she was on annual leave for the last week. KP suggested she can present the Bedfordshire updates and ask WP leads to present summaries of their respective work packages' progress over the last six months.

RR asked anyone who has not yet submitted their progress report to make sure it is submitted today (06/07) if possible.

RR shared his screen and presented the project report completed by BED. This report covered most tasks completed over the last reporting period since BED is coordinating many of the project's activities.

BED has completed some activities relevant for all the work packages. This includes the activities that BED has collaborated with other partners on. BED has supported pilot test leads (WP T1): Whysor who is responsible for Picnic, VDH, BioGros, as well as supporting hardware, cloud and dashboard provision; UU that is leading on Musgrave and WD Meats; UoN leading on the Ramen Spectroscopy pilot tests; UCD who have started working with Burns Meats Farm. I&R is coordinating monthly meetings of WP T1. NTU has been working on the Glen Affric pilot test and is leading on communication activities about all pilot tests.

RR noted that so far, we have linked with 14 pilot test companies which are currently in various stages – some of which did not work out in the end and so not all of them will finish. However, we have promised and are hoping that we will deliver a minimum of five pilot tests, but the more we have the better. We have also developed a template for pilot test story telling. We need to show the activities that are performed for each pilot test. We believe it is pilot test leads who are better positioned to produce the description of the test.

**Action: all pilot test leads to fill in the template for pilot test story telling.**

I&R will make more updates during the WP T1 session in the afternoon.



Regarding WP T2, BED will prepare a separate presentation on the progress of this WP later. RR highlighted that BED has organised four meetings of WP T2 over the previous 6-month period. Special support from MTU and UU has been provided for the maintenance and optimisation of the big data server. BED is also working with Whysor to ensure the data from the Whysor cloud is pushed to the BED cloud on a regular basis.

Regarding WP T3, BED has supported UU's lead on the implementation of the activities. UCD are leading on LCA activities. Data has been collected from HMF and Yumchop, and RR believes we have good data from BioGros from the company visit performed on 05/07/2022. If TC needs more data, RR will ensure we get the necessary data for her.

BioGros has been very supportive and helpful and spent all morning with us yesterday. RR is hopeful we will get a good pilot test from them.

KP has taken lead on WP T3 on what can be done when the project will be closing in July 2023. KP will provide further information on this today or tomorrow. RR also had a brief meeting with Marcel yesterday to try to understand what we can do after the closure of the project next year – he will share these points at WP T3 meeting.

Regarding WPM, we have had an exceptional number of meetings which always helps with the progress of the project. We are now in the 7<sup>th</sup> RAC meeting, thanks to Whysor and BED. KP has taken extra responsibility from finance in this period to prepare for audit at BED.

Regarding WP C, our communication partners have already made their presentation informing partners on what newsletters, posters, case studies, tweets, and others have been produced in this period. RR requested partners to share tweets and posts on LinkedIn too. The project has also participated in many external events.

We have not made much progress on WP LT. This will progress in the next period given the upcoming REAMIT Symposium.

We have completed redeveloping the REAMIT project extension budget and getting it approved by the JS. Last month, the updated budget was officially included and approved in the REAMIT application form. We are in the extension phase as of now.

The development of the sustainability special issue journal is important. RR is using it as a chance to showcase our work in the form of published papers. It is a little extra effort; we've done so much work, it's useful to put it in a paper. This is mostly useful for academic members of the consortium. Hopefully, everyone can support our work in the preparation of the journal. If there are other opportunities in various journals, conferences, etc. please feel free to submit your papers there.

RR requested that each partner sends their progress report to the RAC committee. Each partner should know the committee person for their institution to send it to in order to receive views and feedback.

## **10:45 – 13:15 REAMIT WORK PACKAGE (WP) MEETINGS**

22.15

- **WP T1 Pilot Tests (Chair I&R)**

### **Adapting and pilot testing sensor technologies in agri-food supply chains (GG - Images et Réseaux)**

According to GG, Images et Réseaux have already submitted several deliverables, including:

D1.1 Publication of open call (March 2023): no new submission, note to be submitted.

D2.1 Partner workshop on sensor and Big Data (Jun 2019)

D2.2 Test roadmap (March 2023): no new submission, note to be submitted.

D1.2 Min 5 companies recruited from agri-business supply chain for pilot tests (Jul 2020).

Regarding the deliverables to be submitted by March 2023, these will include:

D3.1 Working prototypes using sensor technology

D3.2 User manual for each pilot test

D3.3 Report on the pilot test and development of the sensor prototypes

Regarding the last deliverable, each pilot test's leader has started to work on it and Images et Réseaux encourages them to continue this work so they will be able to submit it by March 2023.

### **Pilot Tests**

#### **1) Pilot test with Van de Huijgevoort Groep in the NL (Whysor, IH)**

Van de Huijgevoort Groep owns several companies. One of them is a production company for salads, a meat processing company for cold cuts, and semi-finished products like mincemeat, sausage rolls, and stuff, and they also own three supermarkets. In June 2021, Whysor had two meetings with them, and in July 2021, Whysor had an online meeting with NTU, BED and Whysor to talk about their use case. In August 2021, Whysor visited their production facility.

Initially, the goal of this pilot test was to do quality checks on bacteria, mainly Listeria bacteria, and measure overpressure in their production facility. Creating overpressure inside the production room keeps insects out. It is something that companies must do by legislation, and they have overpressure inside the production facility only. However, they have no alarm system when the pressure drops. There is no proof of overpressure, and that is something they would like to do.

The pilot test's start date was July 2022. Whysor investigated several sensors, starting with the fresh detect sensor. The fresh detect sensor was sent by UU and Whysor did some tests. They had a meeting with Matthias Heiden from FreshDetect in February 2022 and decided not to proceed with this part of the pilot, because fresh detect technology was not yet suitable for measuring specific germs, but only for total colony counts and did not fit the question of this pilot company.

For the overpressure architecture, the company has a production room, and two pressure sensors were installed, one inside the production room and one outside. They measure the difference and use an alarming system when pressure falls in the production room. Whysor had meetings with the quality manager from Van de Huijgevoort Groep in January. They talked about measurements on hygiene and measurements on overpressure, and in February, Whysor defined the architecture.

DOL 18 sub-pressure sensors were selected to measure the overpressure. Whysor did some testing inside the office and purchased two electronic sub-pressure sensors for this case. The sensor is designed for use in livestock facilities, however, Whysor believes it is also suitable for the purpose of this pilot test. Whysor plans to install the sensors in July 2022. The tests have been finalised at Whysor office and now they want to start testing at the production facility. The next steps of this pilot include installing the sensors, start measuring the pressure, creating a poster, writing the pilot test storytelling, and analysing some data.

**Action: Whysor to install sensors at VHG, start measuring the pressure, create a poster, write the pilot test storytelling, and analyse data.**

**Action: Whysor to complete the pilot test storytelling of VHG.**

#### **2) Pilot test with Picnic in the NL (Whysor, IH)**

Picnic is an online supermarket that delivers groceries to the customer's home. They use trucks to transport groceries from their fulfilment centre in the Netherlands to local hubs and from the hub to the customers. Picnic started with four delivery vehicles in 2015 and now there are over 1000 vehicles in the Netherlands and they deliver groceries in 120 Dutch cities and villages. Marcel contacted Picnic in 2020 because he thought the company would be a suitable partner for the pilot test. He pursued them over several calls, and the first contact was established with Frank Carter. In July 2021, TV and IH visited one of the fulfilment Centres of Picnic, and installed 20 Elsys EMS sensors (temperature, humidity and acceleration).

The goal of this pilot test was to deliver a personalized cooling profile for the cooling box and link it to the complaints of customers on how the box was handled. After the installation in 2021 data were coming in fine, however within a few

weeks all the sensors stopped sending data. The sensor housing appeared to be not solid enough to withstand the force of heavy groceries. As a solution flexible rings were 3D printed to protect the housing of the sensor (September 2021) and 20 new sensors were purchased and installed (December 2021).

Between the installation until July 2022 Whysor noticed that all these sensors broke down again, not over a few weeks, but over months. Only one sensor is still functioning, which means that the sensor housing is probably still not strong enough, even with the flexible rings on it. Whysor had a discussion with Picnic in March 2022 to find out why these sensors were not working anymore, to discuss if they want to install ten new sensors and the data that the project needed from the Picnic for related projects.

In May 2022, Whysor had a meeting to solve the problems with the sustainability of the housing of the sensors and they had two issues because these sensors were placed in a box that was made of styropor and they needed an adhesive suitable for both hard plastic of the housing of the sensor and the styropor. In addition, they also wanted to change the battery of the sensors, so they would not have to throw away the sensor when the battery runs out.

Picnic agreed to send part of the sensors to Whysor for testing with the adhesive to use and with better protection of this sensor housing. Whysor still has ten sensors left that are not installed and they are going to test them with more of these flexible/protective rings. The next steps include linking the data received from Picnic to the data that is coming from the sensors to see if it is possible to recognize a trip in the data. In the meantime, the sensors that were working have already sent a lot of data, so the analysis of this data can start. Next steps also include the determination of a cooling profile for cool box, the production of the poster and the video.

RR suggested searching for alternative designs of housing for the sensors. IH suggested to schedule a separate meeting to analyse the data from Picnic. RR requested GS, SA and JE to look at the data and conduct a descriptive analysis. KP asked if this pilot test will be linked to the app. IH mentioned that the company would like to have a personalized cooling profile. RR commented that once the project starts getting data from their sensors on a very regular basis, the partners will be able to assess whether there is stability in their system and whether the amount of ice that they are packing is adequate to meet the requirements.

**Action: Whysor to link the data received from Picnic to the data that is coming from the sensors to see if it is possible to recognize a trip in the data.**

**Action: BED, MTU and SenX to start the analysis of data for Picnic.**

**Action: BED, MTU and SenX to determine a cooling profile for cool box.**

**Action: NTU to produce Picnic poster and the video.**

**Action: Whysor to complete the pilot test storytelling of Picnic.**

**3) Pilot test with BioGros in Luxembourg (Whysor, IH)**

BioGros is a wholesaler of high-quality organic and biodynamic foods in Luxembourg. BioGros is a company with a complete supply chain. They have fresh vegetables such as celery, lettuce and mushrooms produced by organic farmers from the cooperative. The products are transported from the farmer to the BioGros warehouse by vehicle trucks. The vegetables are packaged and then transported to retail in small village shops, etc.

The goal of this pilot test is to gain insight into climatic conditions like temperature and humidity in the complete supply chain and then especially regarding several fragile vegetables like mushrooms, onions, potatoes, and celery roots. The company also would like to have more information on the ripening of fruits and vegetables inside the warehouse.

BioGros sometimes experiences quality issues in transporting fresh foods, and they wish to gain insights into climatic conditions there. The architecture includes installing sensors at BioGros grower, warehouse and inside the trucks. The information will be transmitted from the Lori to the Whysor cloud. The sensors selected are digital meter Eagle loggers with temperature and humidity sensors. Whysor wants to find a solution which would allow real-time data upload while the products are moving in the trucks.

Whysor spent two months testing connectivity at different locations as growers, at BioGros and in trucks while on the move. Whysor selected these loggers because of their connectivity, and because they also include the feature of detecting whether a truck is moving or stationary, so-called trade detection. The trade detection enables not only to alarm when trucks are in use but also enables to measure and send data with a lesser frequency when the trucks are not on a trip, which results in much longer battery life.

In December 2021, Whysor researched connectivity in Luxembourg and specific usability with two sensor units. In January 2022, they purchased 15 Eagle loggers and 15 RV/T sensors. In March 2022, BioGros self-installed 15 of these sensors. In May 2022, Whysor had a meeting to discuss the dashboard built for BioGros and to define the settings of the sensors because the default setting sends data every five minutes, and then batteries run out fast. In June 2022, the settings were changed, as well as the batteries. At this moment, Whysor has installed seven sensors in different areas of BioGros' warehouse and ten sensors inside the trucks. The data is coming in fine since the beginning of July 2022.

The next steps include defining the thresholds in which the temperature is correct for each part of their warehouse. The possible loss of quality due to humidity is still unknown, so the range is all green on the dashboard. One sensor is not working, possible because of the battery. In July 2022, Whysor installed three sensors at growers and started collecting data at growers as well. Whysor already started with the pilot test storytelling of BioGros.

**Action: Whysor and data analytics partners to define the thresholds in which the temperature is correct for each part of BioGros warehouse.**

**Action: Whysor to complete the pilot test storytelling of BioGros.**

#### **4) Pilot test with Raman Spectroscopy with Routhiau, IGRECA, ADRO in France (AA, UoN)**

The pilot on Raman Spectroscopy is at the end of the validation step, and the development of the sensor has been finished. UoN validated this in lab conditions despite the absence of technical staff from February/January 2022. UoN has required a new postdoc in 2022, and the candidate (Omar Dib) has been selected as he has experience in data analysis and Raman Spectroscopy.

Routhiau is a French company located in France that produces and sells a range of food products, such as e.g. chicken. Despite using chicken samples to validate the system, many fruits and vegetables from local markets were tested, and the system worked very well.

The pilot test aims to monitor food quality during storage and transportation by utilizing a fast, rapid technique known as Raman Spectroscopy. To reach the pilot aim, the first step is the experimental design, same food samples will be tested in the lab, and the results will be uploaded to the server. Then they will test the technology in the same conditions as the refrigerated truck, and the last stage will be testing in real conditions. The main objective of installing the Raman spectrometer is its capability of informing the company or driver whether the product quality is still in good condition and thus arriving safely to its destination or alerting the driver to deliver the product to the nearest point in case the product quality started deteriorating and thus help in reducing food waste.

The pilot test's experimental design will focus on three main stages. Stage one is lab development, stage two is the transition transitioning phase between the lab and the real condition, and stage three will be the testing in real life conditions. Stage one includes setting up the Raman sensor, testing on foot samples, running data analysis, using specialized scripts, and lastly, uploading the data to the servers. All actions required to complete stage one were executed or accomplished by the pilot test.

Stage one was completed with the help of the company Routhiau. The role of Routhiau was to provide a sample and share their needs. For instance, during stage one, samples acquired from Routhiau were analysed over 30 days by Raman spectroscopy, taking about 50 spectra per day taking into consideration the temperature. Additional analyses were added, such as microbiological analysis and other physical-chemical measurements like temperature and pH. The Raman analysis was conducted directly on the chicken sample, without the package in stage one. The quality decreased, especially on the 26<sup>th</sup> day, but the samples were still in good condition. However, on the 30<sup>th</sup> day the quality decreased to an alarming level.

Stage two included system modification, automatisisation, simulation and validation. All actions required to complete stage two were accomplished, except for validation which has still been ongoing. At this stage, the system was transferred into a refrigerated room to simulate the same condition as in the refrigerated truck. The Raman analysis was done manually, but a motorised stage was introduced to minimize personal interference. The challenges faced using this system include surface topology. The products can present flat and sloped surfaces, which can quite affect the sensitivity of the Raman results. With the help of a motorised stage, UoN was able to move through 13 different zones and take the spectra of each zone. The zones were grouped into two main categories, the flat surface and the sloped surface. UoN analysed each group alone and concluded after several trials that no matter where the Raman signal was acquired, the same signal was obtained.

Another challenge related to the Raman analysis was using packages. To overcome this issue, they compared the Raman signal of the plastic with the chicken samples. They obtained four additional new peaks identified as protein and lipids. The next step included the validation of the results. They started the quality monitoring process on the 6<sup>th</sup> over 60 days and acquired 30 spectra in the morning and another 30 in the evening, making a total of 60 spectra per day. The temperature was also monitored over the process. After this process ends, UoN will upload the data to the server, analyse the results and validate the outcome. After validating the results, they will contact the company and start the last phase of this project, which is testing in real conditions. Currently, the pilot test has completed stage one (lab development), stage two has still been ongoing, and stage three is expected to start in September 2022.

UoN prepared the first draft of the storytelling using the template, which includes a brief description of the pilot test, its role in REAMIT, the communication between different partners, and the project progress. UoN also prepared the draft for the user manual. Both manuals will regularly be updated until the date of submission.

**Action: UoN to complete the pilot test storytelling of Raman Spectroscopy.**

**Action: UoN to conduct stage 3 of the pilot test in real life conditions in a truck.**

## **5) Pilot test with WD Meats (Dry aging chamber) in the UK (UU, JG)**

Dry ageing beef is a premium technique used for flavour development and to tenderize the beef. It involves hanging beef carcasses or hindquarters in a refrigerated room uncovered and left to age for several weeks or even months at controlled temperature, relative humidity, and airflow. It is costly because of high ageing shrinkage, trim loss, risk of contamination, and the requirements of ageing conditions and space. REAMIT project is interested in reducing trim loss, which is a phenomenon that occurs when too much moisture is extracted from beef resulting in unusable dark facings which need trimmed and disposed of before the sale of the meat. UU is trying to reduce the dark facings by tuning the environmental parameters of the refrigeration setup.

The solution proposed includes accurately monitoring and recording the temperature and humidity data in four zones of the ageing chamber. These results can be mapped to determine the dark-facing trim loss, and UU expects to tune the refrigeration parameters to minimise those dark facings. The equipment selected includes a multi-tech Lora Gateway, and

four Ursalink UC11 temperature/humidity sensors. The first study took place on 6<sup>th</sup> July 2021 and ran for two weeks, but, normally, they age the beef for three weeks.

WD Meats are the sole supplier of premium beef to Lidl in Ireland, and they're also one of the main suppliers for McDonald's Europe. Therefore, a lot of the meat they are processing during the study will be sold to Lidl for their premium range. The meat is always dried for 21 days. In the first trial, two weeks were monitored because of when the sensors got installed. On 30<sup>th</sup> March 2022, the sensors were used for 21 days, and the trial ended on 20<sup>th</sup> April. Two sensors were installed at the front of a large, refrigerated lorry container with all the hindquarters hanging up, and two were installed at the rear of the lorry. The sensors were integrated with the Whysor dashboard and contained some analysis done after the first iteration of the trial. The most reoccurring temperatures were in the back left and back in front of the truck.

Lessons learned from the first iteration of the trial demonstrated that Velcro was not a suitable mounting solution due to the amount of moisture generated by the drying hindquarters. The Velcro was changed by cable ties. Some signal issues were observed with the sensors because of the amount of meat in the trucks, which attenuated the signal. To correct this issue, the location of the sensors was changed to be in a more direct line of sight with the gateway. The sensors were also moved from the walls and now are being hung on the hooks at the hindquarters also hanging from.

James visited WD Meats on 10 March 2022 to launch the second iteration of the pilot test. At the visit, he discovered that network architecture used as an interface between the sensors and the Whysor cloud had been deprecated. Marco upgraded all gateways that are maintained by Whysor in 2021, but the gateway used by WD Meats was commissioned by UU, so Marco did not have access to it.

James reconfigured the gateway with the new endpoints for the thins stack. The sensors were re-paired to the gateway since it was running a fresh install. Tom provided the webhook details to connect the gateway to the Whysor cloud. On 30 March 2022, the gateway and four sensors were reinstalled on a trailer which had been loaded the day before. The lorry was unloaded on 20 April 2022, and sensors were taken off. A full 21-day cycle was recorded.

Next steps, James is still waiting for Marco to provide start and end weights for the last trial. Different structuring of carcass's/sensors or different temperature and humidity parameters for the refrigeration unit after results from the baseline trial will be suggested. There are two questions to explore: (1) does airflow affect dark facings? Airflow depends on how many carcasses are located in the trailer and also the structure. (2) are there more optimal parameters which exist for the temperature and humidity which would minimise the dark facings while avoiding harmful bacteria formulation? The plan for the next steps includes changing some of these parameters on 21-day cycles. At present, two more runs are planned for the summer and different combinations of temperature and humidity parameters will be tested to try to reduce the dark facings.

**Action: Ulster to perform two more runs of tests with WD Meats when different combinations of temperature and humidity parameters will be tested to try to reduce the dark facings.**

**Action: Ulster to complete the pilot test storytelling of Raman Spectroscopy.**

## **6) Pilot test with WD Meats (Clostridium Bacteria) in the UK (UU, JG)**

Clostridium is an anaerobic spoilage-causing bacteria found on farmyard or animal hide and has a high prevalence in abattoirs. It is a multi-billion-dollar problem because it produces non-toxic gases which spoil products early. In addition, it can spread easily and only grows once the products are packed.

Currently, WD Meats do swabbing with PCR in a lab based at the University of Bristol, which takes at least 48h and sometimes 72h. As WD Meats are processing tons of meat per time, they are hoping to find a quicker way of detecting it so that they can clean up the factory quicker, which means fewer products are affected. The trial plan is to investigate alternative methods of detecting the bacteria using a trace source of clostridium using DNA sequencing. The goals are a faster method of detection, allowing for immediate clean-up of surfaces when detected that will inevitably reduce the beef waste in abattoirs, retailers and homes.



There has been a lot of waiting to get the relevant materials sourced for this trial. UU needed to get the PCR Mastermix kit required for testing the clostridium, which took almost two months. A positive trace of PCR is required to perform the benchmark testing. JD, professor of microbiology, said that his colleague in UCD had promised half of their supply in mid-2021. They retrieve this material from their freezer and discovered that the bacteria were dead after seven or eight months.

UU purchased Clostridium DNA from DSMZ (a German microbiological company), which was delivered to UU on 17<sup>th</sup> June 2022. UU met with Marco and Victoria (lab technician at WD Meats) on 3<sup>rd</sup> May. They have purchased their own PCR machine (Genesig), which processes samples in approximately three hours. However, they were having issues with calibration and requested UU to support this process and compare results between their lab and UU lab PCR machine to ensure it is functioning correctly.

The next steps were going to perform that validation using the positive strains of Clostridium DNA and confirming same results at WD Meats. JD also wants to perform a DNA sequencing study to identify the source of the Clostridium. Marco is very interested in this research because he suspects that a lot of Clostridium is coming from imported cattle and WD Meats brings in a lot of their beef from the UK, and he would like to identify the exact suppliers and farmers for where these issues occur.

UU is still interested in calculating the minimum level detection using the DNA strain. They had a meeting with a company called Sensip-dx, and they apparently had a machine which could perform this analysis based on some spectroscopy type of technology. The company was involved in the capitalization call, and the next step is to check if they are still willing to collaborate and how the project can incentivise them.

RR expressed his three main concerns. The probe used by Sensip-dx is applied to analyse items in liquid form, so additional effort is necessary to obtain a liquid from the products under analysis. There may be errors in detection, and we still are not sure about the quality of the probes. They may not be interested in working with the project unless there is an incentive for them. RR was positive about the progress made in this pilot test, yet he was not positive about its suitability. RR recommended that JG discuss with JD and JC whether this pilot will be analysed under the REAMIT project or outside the project. According to AA, Raman spectroscopy could be used for this type of analysis and asked James to send some samples for testing. AA mentioned that they have much experience in the detection and identification of microorganisms by Raman spectroscopy, but the analysis directly on food may be very complicated.

**Action: Ulster and BED to determine whether Clostridium Bacteria pilot will be analysed further under the REAMIT project or outside it.**

**Action: Ulster to discuss with UoN whether and how Raman spectroscopy can be used for this type of analysis. Ulster to send some samples for testing at UoN.**

**Action: Ulster to complete the pilot test storytelling of Clostridium Bacteria.**

## **7) Pilot test with Musgrave in the UK (UU, JG)**

Musgrave is the largest wholesaler of groceries in Northern Ireland. They supply one in every four homes. Musgrave deliveries of chilled food produce are performed to various small businesses, fast food restaurants, etc, within approximately 15-mile radius from Musgrave's warehouse, using their own logistics network. Vans performing deliveries are refrigerated, but at present, there is no way of knowing in the cab or the office if the refrigeration units are currently correctly functioning. Breakdowns with refrigeration units can cost the wholesaler full vans of spoiled food. Therefore, they would like an alerting system to know if any issues arise, which should be available to both the driver and the logistics staff in the head office, so the van could be redirected back to base loss, minimizing the risk of food spoilage.

Their larger fleet vehicles already have some temperature sensing devices built into them. However, REAMIT will analyse their smaller vans which deliver to smaller shops. The vans have a big refrigeration unit at the front that creates a freeze zone of around -10 degrees Celsius. Therefore, the vans should be connected to the cloud to allow for real-time data reporting/monitoring while the vans perform deliveries. The vans have both a chill and a freeze zone, and they wanted

both of those to be monitored at regular 5-minute intervals. Alerting system should send SMS messages to drivers and logistics warehouse staff, notifying them if any anomalies occur. Alerts should only be sent if the van is in transit, i.e. they should not receive an alert if the van is stationary when it is parked overnight or if it stopped performing delivery because the temperature can normally increase at those points.

The power consumption of the system should be such that maintaining the equipment does not become an arduous task. The company is not interested in changing the batteries every week or two, so they were concerned about a system that would run on battery power. The solution should be standalone, i.e. it should not rely on mobile phone tethering etc (pairing sensors when switching drivers has been deemed a high-risk, costly overhead).

As a solution, UU selected a cellular logger (Digital Matter Eagle), which both acts as a sensor recording device and a gateway (it contains its own sim card and connects to the 4G network). The logger contains multiple communication buses. It has been configured with two sensor probes, one which logs temperature and humidity and the other logs only temperature. The logger uploads the data to the cloud. For the trip detection algorithm, it needs accelerometer and GPS data. This data is recorded by internal modules on the loggers.

UU worked with the device manufacturer to enable trip detection from the logger. Accelerometer data and GPS coordinates are combined to detect internally if a trip is in progress. This binary trip data (1/0) is then uploaded to the cloud. This algorithm is also used to improve the battery life of the logger, using 'sleep/wake' information.

The architecture of the pilot includes two eagle loggers, which will act as the gateway but also contains the sensor. It uses a cellular connection, and it is connected to the digital matter cloud. The Whysor database makes an IP call to the digital cloud and receives the data from the logger. The data can then be analysed in the dashboard or used by the alerting algorithm, which then generates either text messages or emails sent to any relevant staff.

James worked with Marco on adding a second temperature probe; this involved adding a new sensor which had not been trialled by Whysor before (due to the limitation of the communication buses) because the new sensors were on 3m cable runs to facilitate temperature monitoring in the rear of the van. The sensors needed a 5V power supply, but Eagle loggers only provide 3.3V regulated supply. The solution would be to add a 5V step up regulator to each sensor.

On 23 April, James installed the dual-zone monitoring sensors in three delivery vans at Musgrave. The system monitors both the frozen and fresh produce refrigeration areas of each van in 5-minute intervals while deliveries are being performed. Logistics staff at the warehouse were given access to the Whysor dashboard for real-time monitoring of the vehicles and were added to the alerting service. When no trip is detected, recordings are made every hour and uploaded to the cloud every 12 hours.

Early results show that the system is robust and avoids sending false alerts due to the trip detection algorithm which was developed. Until July, the batteries have not needed to be replaced in the loggers, proving that the bespoke system developed with trip detection technology is energy efficient and of minimal maintenance. After successful initial testing, two more IoT temperature monitoring systems have been prepared and are due to be installed in summer 2022.

The next steps include installing the loggers in the remaining vans. Rule logic for text alerts still needs to be defined. James will monitor the initial data and help Musgrave decide what the threshold temperatures should be for the freeze and chill zones and how long the delay should be before reporting an alert.

#### **8) Pilot test with Glen Affric in the UK (NTU, UR and SB)**

There has been no progress with this pilot test since January 2022. The company is not responding, so NTU decided to stop this pilot test. IH installed one sensor that need to be retrieved. NTU contact point has left the company.

**Action: NTU to recover equipment installed at Glen Affric.**

**Action: NTU to complete the pilot test storytelling of Glen Affric.**

#### **9) Pilot test with Human Milk Foundation (KP, BED)**



Human Milk Foundation was founded in 2016 in the UK. It is a charity that helps more families feed their babies with human milk. HMF provides screened, pasteurized donor milk to sick, premature babies in Neonatal Intensive Care Units and to mothers suffering from conditions such as cancer, which prevent them from breastfeeding their babies.

While HMF has full control of conditions in which human milk is processed and stored at the human milk bank, they have no control of conditions in which human milk is transported between donor human milk bank and hospital. This is where the REAMIT project comes into the picture because the project offers an approach that allows them to constantly monitor temperature at which human milk is transported (-20 degrees), and take action when these conditions change in time to save human milk from becoming waste or becoming not suitable for nutrition.

By working with HMF, REAMIT will not only help save human milk from becoming waste but will also help save several premature babies. The recent meeting with the HMF staff in May 2022, confirmed that human milk banks operate across the globe, so potentially there is a great potential for scalability of the REAMIT approach outside of the UK.

The aim of the pilot test is to monitor the temperature at which human milk is transported between a donor human milk bank and a hospital. This temperature must be -20 degrees, and they have approximately 30-50 trips per day. The milk is transported in very small bottles by motorcycle or car.

This pilot test started in May 2021. Whysor lent two temperature and humidity sensors, which were configured and shipped to HMF in July 2021. Whysor fitted both sensors in September 2021, and since October 2021, REAMIT has started to collect data. The sensor is battery driven and has a GPS locator inside.

ELT Lite logger sensor (ELSYS) and digital temperature sensor (ELSYS) were currently collecting data on temperature. Data is sent to Whysor cloud. Data is then transported to BED server and analysed. At the beginning, Whysor reported connectivity issues with one of the sensors, and it was poorly connected to the Internet, so it sporadically sent data. Colleagues from Whysor came to the UK and fixed the problem physically. In October 2021, Whysor reported that they were receiving data from both sensors. However, data indicated room temperature, which implied that both sensors were not sent on trips with human milk. We had a break-up in communication with HMF for some months last year, but everything was reassumed early this year.

HMF was very happy to scale up the pilot test, so BED purchased 12 loggers and sensors, temperature, humidity and binary sensors for HMF. Natalie Shenker from HMF attended the RAC/WP/RSC meeting in January 2022 and Levstone proposed a Blue maestro sensor and system for HMF, and the team at BED tested it in home conditions first. BED had a meeting with Davinder from Levstone, and he explained the Blue maestro sensor. In the meantime, 12 new sensors arrived at BED, and JG helped wire the sensors. Mike from HMF shared with BED and Whysor a google form, which collects data on trips of human milk. There have been no updates on Blue maestro and system proposed by Levstone.

In May 2022, REAMIT visited Human Milk Foundation and had a very nice tour. At this meeting, JG, SA and other technical partners installed all the sensors, totalling 12 sensors installed. The next steps include data analysis from the sensors installed at HMF and proposing an app for HMF conditions.

HMF is keen to keep developing the system. They are a foundation running based on venture philanthropy. They do not have the funds to keep investing in the system we proposed to them, but they are keen to keep exploring and working with impact investors and venture philanthropy to find additional funds to help them develop the system. The system has the potential to be scaled up not only across the UK, Europe, but also across the world. Natalie and her colleague Jillian work as advisories to different ministries across the world, helping them design human milk banks. Therefore, the next steps for REAMIT also include developing policy briefs / policy proposals based on the pilot test with HMF.

Feedback from Mike (HMF): Because of the few staff at HMF, Mike does everything: collecting the milk, accepting, counting, pasteurizing, reviewing, putting in bottles, putting in freezers, preparing for transportation, etc. He's also the only one who does all the sensor practical things, and he is not able to play with the opening and closing of the sensors so many times when they are not connecting properly. He said they would appreciate a ready-to-plug-in solution because of the staff shortage. Thus, they had this breakdown of contact in November 2021, when they were just unable to deal with the connectivity issues. Opening up the sensor, and changing the batteries, he said he had to do it five times before the sensor caught connectivity again. This took a lot of time.

**Action: BED to complete the pilot test storytelling of HMF.**

#### **10) Pilot test with Yumchop in the UK (KP, BED)**

Yumchop is a British-based family-owned company producing ready-to-eat frozen meals with African flavour sold through vending machines. Currently, REAMIT is looking for controlled temperature and humidity data. The pilot started in December 2020. There are different locations in the food factory, different zones, freezers, cold rooms, vending machines and kitchen fridges. In total, ten sensors have been installed by Whysor, providing information on the temperature levels inside different zones. There are different temperature ranges for different zones, and when the temperature goes above this range, the alerting system sends an alert to Yumchop.

One of the positive aspects of having this pilot test was that Yumchop realized that they do not need temperature -30 degrees in some freezers. So, they can increase the temperature to -24 degrees, which means a lot of energy saving for the company.

BED and UCD recently had meetings on life cycle assessments, and there was some break in obtaining data from Yumchop in January this year. The company partners can have access to the dashboard, they have all the permissions to change things by themselves. Weekly reports are generated by Whysor for each fridge and freezer. Recently, BED was also advertising placement opportunities at Yumchop for students or graduates. Between January and April, there were different alerts sent to Abby, who is the co-owner of the company. Whysor helped resolve the issue. On 25<sup>th</sup> May, some partners from UCD, UU, NTU and BED visited the factory, and the problem was corrected. Abby confirmed her willingness to expand the pilot test and move to the vending machines and vans. The next step would be data analysis of data from Yumchop and the connection to the application.

**Action: BED to complete the pilot test storytelling of Yumchop.**

#### **11) Pilot test with Burns Farm Meats in Ireland (XC, UCD)**

Burns Farm Meats is an Irish company recruited by REAMIT partners in UCD in February/March 2022. It is a small family-run business. They have their own farm, which also works as an abattoir in Sligo (northwest of Ireland). They slaughter animals, but they are committed to animal welfare and providing high-quality meat. Their operations include an abattoir, dry ageing of beef and lamb, wholesale of beef, lamb and pork to the catering and hospitality sector, delivery of retail orders to the public and processing organic beef, lamb and pork.

The company has refrigeration units where they store beef and lamb carcasses during the meat maturation of the dry-ageing process. The latest efforts in the company revolve around modernizing and equipping themselves with the appropriate tools to monitor and control the environmental conditions of these rooms to avoid loss of meat. Specially, attention should be paid to two refrigeration units of the company where they store beef carcasses during the dry ageing or maturation. Maturation of the meat takes 15 to 21 days approximately. They have observed the spoilage of the meat, and they are trying to equip themselves with the appropriate tools to monitor and control the environmental conditions of these rooms.

XC, JG and GS visited the company on 23 March 2022. They have observed that they lose around 5% of every piece of beef, especially the areas of the meat that are more exposed to the surrounding air, i.e. surface areas around the end parts of the carcass. They suspect these rooms remain open for too long, thus the temperature is not remaining within a proper range. Monitoring humidity is also of interest to help prevent microbiological activity. These two rooms have the following dimensions: one large room of approx. 20m<sup>2</sup> and a smaller one with 10m<sup>2</sup>.

The aim of the pilot test is to monitor the temperature and humidity conditions in the cold storage rooms and try to solve the problem of spoilage during the dry ageing process, especially concerning the parts of the meat with more exposure to the environment. The plan is to deploy ten sensors in total, six in the big room and four in the small room. The equipment purchased is an Elsys ELT-2 with a micro IoT LoRaWAN Gateway and two internal antennas for temperature and humidity. Pilot start date plan is August 2022.

Getting the supplier in the UCD's approved supplier list has been a lengthy process, however, a purchase order has already been sent out to Sensational Systems (UK) for the purchase of the gateway and the sensors. The supplier is pending payment from UCD invoice office to ship the equipment. A site visit to install the sensors is estimated to occur by the end of July 2022.

**Action: UCD to complete the pilot test storytelling of Burns Meats Farm.**

## **12) Pilot test with 3D Fluorescence sensor (UU, JG)**

The idea of doing something with 3DF originally came because Matthias Heiden was originally on the REAMIT application form. However, by the time the project got funded, his company had gone into administration, and the project still has a pilot test associated with 3DF.

One FreshDetect was lent to UCD, which has now been lent to IH. One Fresh Detect has been lent to TA at BED where a master's student examined using the FreshDetect device to approximate the ripeness of soft fruit (strawberries, raspberries, etc.). TA investigated the use of FreshDetect for VDH project (for Salmonella, Listeria, etc). After the consultation with Matthias, it was agreed that this was outside of the scope of the REAMIT project.

IH/VDH Group have a new idea for the rapid detection of the TVC of preparation surfaces, as this measurement is directly linked to the expiry date they can use on their products. A high TVC reading would allow them to perform a deep clean on surfaces before continuing food preparation.

Thoughts of potential use in the checking of poultry products being delivered to Musgrave Cash and Carry. Matthias confirmed that some testing had been trailed through cellophane, however the cellophane would need to be pressed right against the poultry fillet in order to achieve an accurate reading. Additionally, FreshDetect needs to be used on a flat surface of the poultry to produce an accurate reading.

TA performed some initial studies with her Master's student and said that operating FreshDetect through cellophane significantly decreased the performance and reliability of the measurements. JC hopes to hire a researcher to lead this study over the summer at Ulster. She may hire a third party/contractor to help with the study if required too.

RR mentioned that FreshDetect appears to be a good way to detect the total bacteria amount. Yet, in his opinion, this is not useful for the project. The REAMIT experiments have indicated that 3D fluorescence cannot detect anything relevant to reduce food waste, so that may be out of the scope of the project.

**Action: Ulster to complete the pilot test storytelling for 3DF sensor.**

22.16

## **13:45 – 15:45 WP T2 Big data integration and application to reduce food wastage (Chair SA, BED)**

Deliverables as per the Application Form:

- Creation and launch of interface for each of the pilot tests for collecting data from sensors and sending it to cloud for use in a transnational Big Data infrastructure (by July 2022).
- User Manual on launching the interface (by July 2022).
- A big data platform with capability to collect and store sensors data from all REAMIT corridors (deadline December 2022).
- Reports on Big Data platform performance (deadline December 2022).
- A web-interface with self-enrol facility for enrolment of potential suppliers and consumers of food produce (deadline December 2022).
- User manuals for the Big Data platform and the web-interface (deadline December 2022).

- Launch of smartphone APP for linking food owners, truck drivers and warehouses (deadline July 2022).
- An additional deliverable: launch of second database of potential buyers (food charities, convenience stores, etc.) in REAMIT corridors – the route where trucks would travel. This database will be developed by Levstone.
- Deployment of the integrated IoT/Big Data analytics/Decision support technology (deadline July 2022).
- A user manual for the integrated IoT/Big Data/analytics/Decision support technology (deadline July 2023).

- **Presentation by an external speaker, Rian Mc Donnell, CEO of FloWaste**

Rian Mc Donnell, CEO of FloWaste, presented “FloWaste, Reducing Food Waste Automatically”. FloWaste is a food analytics platform that reduces food waste automatically for cafeterias and industrial protein processors – beef, pork and chicken. They work with companies such as Kepak, ABP and Gourmet Gorilla. Their customers want to reduce their yield loss, food costs and food waste. But their customers do not have the information required to do so. FloWaste installs sensors at various stages of the food supply chain that can understand the food in question and return key features of it. For instance, they can see how thick the backstrap of a sirloin steak is, how well trimmed it was by the butcher, etc., which translates to how efficient these companies are. Analysing all of these features informs them of how well the companies do in terms of yields.

Their process is the following: 1. They collect data; 2. They analyse it in real time with machine learning and computer vision techniques; 3. They provide the associated or learned insights, 4. This leads to increase of margins – more food yields, increased accountability, quality control.

FloWaste targets a big market across USA, EU and UK - companies like ABP, Tyson, and cafeterias (smaller businesses). Rian talked about a 259M USD as serviceable obtainable market. They are currently a team of six, and, in addition, two part-time people. Rian concluded his presentation by informing that the profiles of people they are mostly looking for are operations managers at beef and pork processors, and also food tech partners or strategic partners in general.

During Q&A, RR asked what type of sensors they used. Rian explained that they relied on one sensor unit for all of their installs – that is an intel real sense depth camera. This camera has stereo vision (including volumetric vision), IR (infrared) emitter and receiver, RGB images – all of these are the data they use to get insights.

- **Big Data Hub at BED (SA and JE)**

Regarding metadata requirements, SA, JE, KP, and GS had a meeting on 23 June 2022. They discussed five issues, which SA provided an overview of.

First, she talked about the availability of new data every Thursday. JE and SA always check for availability of new data every Thursday. They kept communicating with TV (Whysor), as there had not been data export in the last month – there was an issue with the VPN that prevented access to the REAMIT server. As for the real-time transfer between Whysor cloud and BED server, REAMIT partners from BED, UU, MTU should be working on resolving this issue in the next months.

Second, regarding consistency of data for the new period (all pilot tests), and what are the data requirements specific to each pilot test. GS clarified that data consistency should be maintained for each pilot test. More responses on the google form are desirable. A data collection strategy folder was created (SharePoint) and contains documents specifying data requirements specific to each pilot test.

**Action: Levstone to send any extra data parameter required for the app development as it may differ from modelling data requirements.**

Third, the scope for cleaning the data should ensure consistent data labels. Thus, data labels must have unique indexes to avoid duplicates. Whysor should implement the indexes (in progress).

**Action: JE to arrange a meeting with GS and tech team to ensure consistent data labels.**

Fourth, development of a framework for metadata and documentation for each pilot test. Metadata documentation to be done from data collection strategy documents and every already existing document for each pilot test. GS was working on the first draft for HMF which was then under review. Editing of this document will continue further.

Fifth, regarding data analysis strategy for each pilot test, partners had not been able to develop this point in full at the time. Also, it was concluded that there was no need to keep meeting regularly to discuss these five points, but partners may decide to meet and share ideas regarding data analysis strategies.

SA explained the data analytics journey with HMF, from early discussions with the organisation to infrastructure set up, further development on data analysis strategies, among others. Sahar presented updates on the pilot tests. In late March 2022, JG had wired ten loggers, ten temperature and humidity sensors and ten binary sensors. A visit at HMF took place on 23 May 2022 and included a tour around the premises, presentations, and checking the installed equipment.

- **‘Blue maestro sensor and its suitability for REAMIT pilot tests’, presentation by Levstone**

Earlier this year, Davinder had asked KP if some partners could evaluate their technology. Three blue maestro sensors were given to KP, SA and TA. A couple of meetings were held with DB to explain how it worked. The original idea behind the application was that the user can configure everything themselves. DB mentioned that it looked complicated. He gave a recap on the application and he said that data can be captured, even Whysor data, but that it needed to be a “meaningful data” for transaction in some sort of block form, so that people could analyse it.

Levstone looked, namely, at the UK pilot tests, how can these transactions in block be built. As Davinder mentioned, Yumchop is static, mini-scada systems, as they (Levstone) call it. Contrarily, HMF is on the move, and regulations play a big part in his opinion. They had launched an application, a high security private group with GPS tracking. One can integrate it with IoT sensors at present. They had two sensors available: Blue maestro and Miniew. Blue maestro had a few issues, while Miniew seemed promising with a more range. Good battery life for the sensors was tested.

The application showed sensors whether on a car, house, person, depo, etc. One can see their battery life. A screen showed a graph with temperatures over time. This being real-time as Davinder pointed out, the graph is designed to show what was going on in real-time rather than historic. Once you have the sensors configured, there was no app interaction needed. Also, the system was GDPR compliant.

In Davinder’s opinion, it was crucial to build in metadata to know when a journey starts, by who, etc. KP, TA and SA, who carried out testing, concluded that the application was too complicated. Going forward, Levstone proposed another idea. This new idea was to create another, private (not on Google Play store) application from the existing one and make modifications based on the idea of test road. This application would only have full functionality for admins. Drivers, however, would only have access to three buttons - based on traffic lights. Once they pressed start this would give a point in time - when the journey starts. All one can do after the sensor have popped up, is to kill the application with the red button. Since February 2022 they have introduced Miniew scanning on the application.

#### **Discussion regarding Levstone application**

After Davinder’s presentation a discussion on the present application took place. RR mentioned there was no need for a new application to be on Play Store. Davinder expressed his concern on having a new application Google-approved. RR also asked about the compatibility of the application with the Whysor system and what could be done so that REAMIT used both. Davinder insisted on having two points in time, start and end of the journey, to be able to query the data. Whysor was purely logging data and it was needed to give the data some context, he mentioned. RR proposed for Davinder to work with Marco, Tom, etc, data to be collected from their system. Davinder mentioned their data structures were fine,



and that it should not be an issue to retrieve the data from Whysor. But he insisted on the two points in time to know when to query. As he said, Whysor data was not real-time.

RR mentioned that real-time data was needed, as much as historical data. Davinder would marry data first and then store it. Davinder said that they would need to configure the existing systems in their system. The issue was, once they have that configuration, they needed to know what the “task” was – to match time and sensor ID.

RR clarified two points about the needed application. First, a smartphone system that used data collected by Whysor – a smartphone version of that. Second, a smartphone system on the road with GPS and related information.

RR asked if we had an application that could work with already collected data and that could send alerts – Whysor produced the computer-based version, but REAMIT needed to have the smartphone-based one. Davinder was not completely sure about working directly with Whysor cloud.

TA clarified that the main issue with the application was that it was not a REAMIT application. Instead, it was an existing application, with many functionalities that were not needed, and that they were trying to adapt it for REAMIT use. TA emphasised that REAMIT needed something similar to Whysor, as made specifically for REAMIT, and ideally customisable for each pilot test. An additional complexity at present was, however, that it would need to work with the Whysor system.

Analogously, KP also said that she was expecting a REAMIT-tailored application. Levstone had developed a non-REAMIT application which they were now trying to fit in REAMIT. As a result, REAMIT did not have a dedicated application.

Davinder insisted on the two points in time and pointed out that to customise the application for each pilot test, there was probably no time left. To make the data contextual, they had added “tasks” in the current application, other data would be meaningless.

RR asked if REAMIT could trial both Whysor and Levstone systems in the new pilot test (perhaps a new pilot at NTU) at the same time. Also, RR asked if Levstone could develop a smartphone-based application. Davinder explained that there was one already. RR said that, hopefully, in a new pilot test, the REAMIT team could trial both. Whysor would still be there until the end, he added. IH mentioned she did not see a problem with this.

RR concluded that the two systems should be trialled together, that it was the best way to go forward.

YD reminded the team to prioritise work, accordingly, given constraints of time.

KP asked about implementing this in HMF given its huge social impact and potential funding opportunities. RR said that it was an option that could be explored. Davinder liked the idea of implementing it in HMF but mentioned the difficulties of integration. RR suggested to include Levstone sensors along with Whysors sensors and trial them in parallel.

**Action: Levstone to develop REAMIT specific App.**

- **‘Development of a SmartPhone APP for REAMIT and a second database of potential buyers (food charities, convenience stores, etc.) in REAMIT corridors’, presentation by Levstone**

RR mentioned to Davinder that REAMIT had promised another database for potential demand points, for self-registering and that would have information about various demand points alongside routing that REAMIT trucks would go (the “second database”). The deadline was December 2021 and we needed to have it in operation.

Davinder said he believed that once they had the traffic-light based system in operation, we would naturally have the second database.

**Action: Levstone to develop a second database for potential demand points.**

- **REAMIT data analysis: further results presented by REAMIT data analytics partners: MTU, SenX, BED, Levstone**

## **MTU**

GS presented WP T2 data activities (HMF, Yumchop, Picnic, BioGros, WD Meats, Raman). He provided a summary of the activities in the last six months and the progress accomplished so far. GS talked about the different aspects of WP T2 activities. In particular, he covered three main components: continuous data analysis, setup and maintenance of Big Data server, structuring and formulating data and, finally, meat data requirements and strategy for each pilot test.

GS talked about the number of WP T2 meetings (no. 5) and other multiple meetings on data architecture and metadata requirements. Efforts were in place to make further analysis to reduce food waste. GS explained that there was more data in these six months than in the past and that each pilot had a different journey. From the performed analysis, partners tried to obtain relevant findings, and based on those, keep refining analytics to provide the company with valuable insights.

HMF: The team was performing time series analysis at the beginning. Later, Google form metadata was obtained, and the team tried to make further analysis, trying to answer, for instance, how does temperature change when the milk is on the move? Based on results then, Gautam tried to predict maximum journey duration and performed ANOVA analysis.

GS presented graphs on the rate of temperature change. He categorised the data into six journey durations and tried to find how the rate of change of temperature in time (from the bottom most temperature value data point) is being affected by different parameters such as bike size, vehicle type, quantity of milk, among others. He performed linear regression models and ANOVA, and he found that the temperature rise is lesser for higher quantity of milk, as well as lesser for lower temperature outside. Based on the models it was possible to predict the maximum recommended journey lengths and advise HMF accordingly. GS concluded that REAMIT will need more Google form type data to continue this analysis further as it was only a limited amount that there was available at the time. Also, this analysis could be extended to traffic information, weather, etc.

## **Yumchop**

An initial analysis showed that there were glitches in the data which Gautam assessed and tried to identify their patterns. GS explained that it was seen that when there were spikes in the temperature, the temperature was raising at a constant rate. From this, he explained that a pre-emptive alert mechanism could be implemented to inform Yumchop of possible spikes in the near future.

GS showed the pre-emptive alert that had been already tested by himself and Whysor partners. If the raise in temperature was more than 2 degrees Celsius in more than three consecutive data points, an email was received. This could also be configured for a mobile phone (SMS).

GS discussed also statistical process control (SPC) analysis. He performed SPC for data spanning over a month and he found relevant insights. He showed that three graphs were produced with SPC:  $\bar{x}$  bar, R chart and process capability analysis. These charts could be obtained every day and could be integrated into the dashboard. SPC would be a useful analysis in addition to the already existing graphs and also an appropriate way to indicate whether the sensor data was under control. This could lead also into proving pre-emptive indication of process being beyond statistical control limit. SPC graphs could be generated every day, for all sensors, and for other pilot tests, not only Yumchop, and provide reports on a real time basis.

Future work would include further exhaustive analysis moving from descriptive to prescriptive and predictive analysis. In the future, more metadata will be useful to gain some more valuable insights, for example customer feedback data. RR pointed out that SPC could be really interesting for the Picnic trial as it would be possible to advise them on the amount of ice they need for cooling in a controlled manner.

## **SenX**

JV presented the various contributions of SenX on WP T2. What relates to partner contributions, they include the following: 1) to pull data from the SQL server. As JV explained, a conversion to time series structures was developed. This was in the form of automatic data synchronization scripts that JV had uploaded on SharePoint. Second, to qualify sequences of data, he implemented an algorithm called matrix-profile, which was able to find motifs (typical patterns), and able to find discords (patterns that are anomalies/atypical). JV showed example graphs demonstrating the different

types of motifs that could be found using the algorithm. Jean-Charles explained that it might not be useful for REAMIT current data but that it was a tool that could be implemented in the future if needed. He had uploaded the scripts for Matrix profile (Warp scrips) on SharePoint.

Third, finding seasonality on the data set. JV had been working on how to find seasonality and remove it for analysis, that was to make the data stationary for some data analysis techniques like ARIMA. JV showed an example of an auto correlation function that provided seasonality candidates and could be implemented for REAMIT data. Fourth, a script that returns descriptive analysis statistics per time series including cardinality, modes, mean, standard deviation, minimum maximum, median time step, and any desired custom function. Fifth, automatic forecasting; JV presented his work on forecasting based on collected data. First, he split the data into appropriate subsets based on thresholds and time steps. He found that ARIMA and SARIMA performed the best. He also conducted a Dickey-Fuller test for integration order. The auto-regressive and moving average orders were grid-searched. Jean-Charles showed a forecasting dashboard example with ARIMA.

Sixth, connecting dashboard to the data - Discovery (Warp10) to build dashboards. There was a dashboard for each dataset, and tables with seasonal cycle candidates and descriptive statistics. Graphs were dynamic allowing time shift, zoom in and zoom out.

JV showed an example for HMF, a “Discovery explorer” dashboard.

Moreover, alerting system building blocks. JV explained that the need of building blocks was because the data was not live at the time being. The building blocks generated time series of alerts. This alerting system could be linked to a connector for sending notifications.

Alerts could be raised based on different criteria. Three criteria over which functions can be implemented included: threshold, statistical outliers, and forecast errors. To manage the alerts, JV had generated scripts - available remotely on Warp fleet repository.

JV provided details on the deviations to be aware of. First, Warp10 was implemented on Jean’s computer, thus, access to the BED server was needed. Second, the data was not coming in real-time at the moment.

### **SenX discussion**

RR asked about the potential use of these alerts for REAMIT clients and how it could be implemented in REAMIT. JV had been working on a Warp based alerting system for the REAMIT clients but it was not yet implemented in the REAMIT platform. JV explained that he would need access to the BED server to install and link the Warp platform.

Also, RR asked for some clarification on ARIMA and SARIMA: they were implemented with HMF data, but the same script can be used for other datasets, Jean-Charles explained.

RR was interested in the forecasting potential of the automatic forecasting: the automatic forecasting could predict a change in temperature, for example, in the next five minutes. Forecasts were based on the last hour or two hours, JV explained, as this was data collected during the journey of a vehicle, in this case it would not be possible to forecast, for example, two days in advance but it still could be useful to predict during the course of a journey. For other pilot tests, this situation may be different as they are not journey-dependent.

The automatic forecasting can indicate whether temperature could cross an undesired value in minutes.

RR also inquired about the feasibility of integrating JV system in the REAMIT server, to which JV expressed that it should be possible.

TA asked if the system could be integrated with Whysor – as BED server not being real-time. JV pointed out that this would need to be discussed with Whysor. Marco Kull proposed that JV could use Whysor’s API to request the data or alternatively create a data route to a customer server that would need to be set up so that sensor data would be pushed in real time.

James pointed out the future objective/possibility of converting the BED server into a real-time server.



TA and other partners concluded that it would be more robust to try the Whysor's API approach for the time being.

**Action: SenX and data analytics partners (and Whysor) to integrate SenX system for data analytics with Whysor API approach.**

### **Whysor**

TV presented the new functionalities within the Whysor Dashboard and made the point that the new features were included in the last months.

A map widget adds support for GPS moving sensors. TV showed that it can display sensor locations on a map – where a sensor was at the time, but also display historical spots. It was also possible to visualise a trip, applying certain conditions to display temperatures or sensor data. Additionally, it was possible to monitor trips “live”.

The map showed many markers on the map – it is possible to zoom in and select the specific point of interest. A click on the marker would then show the corresponding values.

Generating a dashboard on the go from the map. A simple click on a button in the map widget could generate a dashboard automatically – this could be useful when someone needed to track a lot of sensors but did not want to generate dashboards from scratch all the time, TV explained.

Whysor had also been working on making more languages available. They added Portuguese and they were working on Italian.

A function to add favourites to your dashboards. It permitted quick access to the desired dashboards. Within a dashboard, a new feature was added to quickly add filters that updated the whole dashboard automatically. For example, it shows data only in the last seven days.

22.17

- **WP T3 Business development of REAMIT technologies (Chair UU)**

JG (UU) introduced WP T3. While discussing it, he made the point that the outcomes of WP T1/T2 should be brought closer to the market. Also, business cases as far as TRL8 should be developed.

Regarding objectives, we should understand development potential of REAMIT technology and development of technologies towards consumer grade. Finally, how to attract future end-users.

**Activity 1 - Risk, technology and sustainability assessments of REAMIT technologies (led by UCD with support from NTU, UU and BED) - Jan 2021 – July 2023**

Risk assessment identifies potential risks to the marketability of REAMIT technologies in the long run. Technology assessment will study how users perceive the usefulness of REAMIT technologies to identify potential bottlenecks in the long-term adoption. Financial barriers will also be analysed as part of technology assessment to support enterprises. LCA and Sustainability assessment is used to highlight the impact of REAMIT project in reducing food waste using the waste measurement framework.

- Deliverable 1.1 – September 2022

An assessment report of REAMIT technologies including a comprehensive systematic review (mapping) of the technical and business landscape in the fresh produce food chain.

- Deliverable 1.2 – July 2023

The life cycle assessment system will allow environmental impact data to be integrated with REAMIT IoT sensor and big data solutions.

### **Activity 1 results by TC (UCD)**

Activity 1 consists of 2 deliverables; 1.1 systematic review (mapping), and 1.2, life cycle assessment.

What regards Deliverable 1.1 (systematic review – mapping), an assessment report of REAMIT technologies will include a comprehensive systematic review (mapping) of the technical and business landscape in the fresh produce food chain. It will be a joint effort of UCD and UU.

At this point, a review article is being written, on “A comprehensive review of real-time sensor technology and its potential application to reduce food loss and waste: the use of Internet of Things in food supply chains”. The objective of the article is to highlight to what extent direct measurements, in particular sensors, are involved in food loss and waste reduction. This paper also provides insight into IoT architecture as well as sensor technologies. The plan is to submit this article in special edition of Sustainability Journal.

As for methodology, initially a literature survey was carried out. A number of studies/articles were identified through database searching of terms “food waste” OR “food loss” AND “dynamic” OR “real-time” OR “IoT” AND “sensor”. A total of 313 articles were identified through this search. Then after a further preliminary screening, 114 articles were removed from the result. A further screening related to relevance was conducted and as a result 45 articles were found suitable for analysis. A further 14 studies were also included from citations within the previously identified studies, thus making total study count as 59 for the analysis.

XC (UCD) presented the main findings from the analysis. As he noted, it was observed that there has been an increase of academic studies related to the challenges regarding food loss and waste. This could be due to the increasing commercialization of sensors over the years. The oldest publication in the sensor technology in food supply chains is from 2008. What’s more, a network model was presented for the co-occurrence of keywords. The most cited term in the selected articles were IoT, sensors, internet, temperature, agriculture and cold chain. Also, the most common sensing parameters analysed by the selected parameters are temperature (36%), relative humidity (27%), gas concentration/composition (13%), and light intensity (7%). The most typical communication technology used to transmit the sensor data are Wi-Fi (24%), GPRS (12%), RFID (12%), and Zigbee (12%).

RR advised XC and TC to do more analysis and go through systematic review literature and he said that the current work looks preliminary.

With regard to Deliverable 1.2 – Life Cycle Assessment (LCA) for REAMIT, results were presented by TC (UCD). She emphasised that the life cycle assessment system will allow environmental impact data to be integrated with REAMIT, IoT sensor and big data solutions. The submission time of this deliverable is till July 2023.

For this deliverable, we are preparing a review paper on “Real-time data monitoring and its potential application to support dynamic life cycle assessment in food supply chains”. It was submitted to International Journal of Life Cycle assessment.

Methodology used here was similar to the previous study. A total of 436 studies were identified initially through databases searching of terms “life cycle assessment” OR “LCA” AND “dynamic” OR “real-time” OR “dynamic life cycle assessment” OR “DLCA” AND “sensor”. Then after a preliminary screening, 91 studies were excluded and after a screening for relevance, 317 more studies were excluded. After including 9 studies from citations based on previous studies, a total of 34 studies were finally shortlisted for analysis.

As TC concluded, the adoption of IoT technologies can allow automatically real-time data collection essential to assess important variables for LCA, such as raw materials and energy consumption, emission flows, etc. Also, the real-time data collection allows performing dynamic environmental analysis while environmental damage is being caused, rather than statically relying on historical data. What’s more, the effective integration between IoT technologies and LCA offers the possibility to predict appropriate corrective actions or alternate manufacturing scenarios based on real-time environmental impact. Many applications have demonstrated that the integration of IoT and LCA is effective and has potential applications. The environmental impacts that these technologies help to avoid must be balanced with the environmental impacts they generate themselves, keeping in mind that these impacts may not be of the same nature and therefore lead to dilemmas.

Main limitations include the following the fact the companies in the supply chain may consider the LCI-date related to their processes as sensitive data and would require protection measures or be reluctant to share it with environmental specialists, who occupy a central position in the LCA. Also, dynamic LCA relies on quantitative relationships among key

input and output parameters to characterize any casual effects within a unit operation. Identification of these parameters for each unit operation can be also challenging. What's more, not always all flows associated with the product life cycle can be automatically tracked, e.g. during the extraction of resources or after the use phase. For these processes, it can be necessary to manually inject LCI-data. Finally, time and effort are required to process and modify the exported data from the IoT technology to match the required input format of LCA tools.

### **LCA for Yumchop**

TC updated about key timeline dates about LCA for Yumchop and various processes in Yumchop that were considered for LCA. As she noted, sensor inventory was studied for Yumchop. Yumchop measured temperature and humidity.

TC shared the LCA results for using sensor by Yumchop. For example, PCB of sensor amounts to 0.983 kg CO<sub>2</sub> equivalent, LoRa module is 0.13 CO<sub>2</sub> eq., LiIon batteries 0.837 kg CO<sub>2</sub> eq, etc. Total impact of sensor is 2.716 kg CO<sub>2</sub> eq. TC showed data collection for Big Data server. The data for electricity consumption by Big Data Hub for its use for the pilot test was collected based on the memory usage. Then LCA was done using this data. For eg. for Yumchop, the electricity consumption was found to be 0.538 Kg CO<sub>2</sub> equivalent. Also, TC presented data collected for Yumchop, most of which was collected during visits to the site. She showed LCA results for Yumchop pilot test too. The impact was mostly due to use of sensors.

### **LCA for HMF**

TC updated about key timeline dates about LCA for HMF and various processes that were considered for LCA. Sensor inventory was studied for HMF. HMF measured temperature. She showed LCA results for the sensor inventory. Like other pilot tests, the PCB and batteries have been found to have the highest impact among all the sensor components in LCA.

For LCA, Big Data server inventory was studied. The electricity consumption data by the server corresponding to the HMF pilot test was collected and used for LCA. The global warming impact of Big data server was found to be 0.195 Kg CO<sub>2</sub> eq, which was slightly lower than Yumchop.

TC presented data collected for HMF LCA, most of which was collected during visits to the site. The results for LCA for HMF inventory were presented. The two most significant impacts were by transport from donor house to the HMF and by the transport from HMF to the hospital/community.

TC discussed the impact contribution of various technologies in HMF pilot. She showed some future scenarios for LCA too. For example, if REAMIT is able to reduce the human milk waste by 100%, we will be able to reduce the impact by 277.5 kg of CO<sub>2</sub> eq.

Finally, TC also showed the future work plan. HMF and Yumchop LCA are completed. TC is currently working on WD Meats LCA.

During Q&A, RR said that he liked the work and found it thorough. He asked, based on LCA study, if investing in sensors system is better if we compare it with the amount of waste we can avoid using the sensor system. TC mentioned she had the information regarding the HMF, but for Yumchop she would have to explore it further.

RR also asked if TC was planning to feature it in Sustainability issue. TC said: Yes.

JG introduced Activity 2 of WP T3.

### **Activity 2 –Future-proofing REAMIT Technologies (led by UCD with support from BED) – Jan 2020 – July 2022**

Technology assessment will study how users perceive the usefulness of REAMIT technologies to identify potential bottlenecks in the long-term adoption. The synergy that exists between sensor development, big data analytics and food quality analysis requires that novel sensing technologies and existing sensing technologies be continuously created and adapted respectively. Therefore, screening and assessing of alternative food quality analysis sensors will be performed.

One Deliverable has been identified.

Deliverable 2.1 – July 2022 (to be finished before Dec 2022)

Current and identified future REAMIT technology assessment report.

JG updated on the current status of this activity. What regards current REAMIT technology, Yan with support from UU carries out a quantitative survey. Last update meeting was held in mid-May. Also, Yan will make updates based on suggestions by Trevor and distribute a new draft. Trevor has analysed results from Survation. He has confirmed the results are very good and would recommend we proceed in using them to collect our survey responses based on his recent experience. “You just need to very clearly define what you are requesting from them”, he said.

#### **Identified Future REAMIT technology**

Literature review performed for Activity 1 will help inform the future technology section of the report by identifying current trends in the R&D space.

RR suggested that it would helpful to look beyond traditional articles in literature review for identifying future REAMIT technology.

#### **Activity 3 – Market assessment (led by UU with support from BED, I&R, Valorial and NTU) Jan 2020 – July 2023**

It is essential that SMEs understand the market opportunities which are growing in the food sector. REAMIT partners will jointly develop a market foresight report which will inform SMEs of market opportunities for the REAMIT technologies. Partners will draw upon the expertise of enterprise agencies and sector specific organisations to identify the potential markets for new technology approaches in reducing food waste.

It has one deliverable: **Deliverable 3.1 – Market readiness report – July 2023**

A market analysis and foresight report identifying forthcoming opportunities for REAMIT technologies to be developed into marketable products.

#### **Activity 4 – Development of business case (led by UU with support from BED, I&R, Valorial and NTU) – Jan 2020 – July 2023**

The REAMIT combination of technologies will have enormous potential for development into marketable products which can offer real-time solutions to agribusiness and food companies. In order to create the greatest opportunities to derive from the work of the project, the partners will develop, leading to the Business Prospectus, based on the market readiness report and technology assessments above. Justification for achieving 40000 tonnes of waste reduction will be included.

Two deliverables have been identified:

**Deliverable 4.1 – Business prospectus – July 2023**

An outward-facing document will be made available to SME technology developers, to potential buyers of technology approaches (large agri-business and logistics companies) and potential investors who can see the possibilities for product development.

**Deliverable 4.2 – Business case for achieving 40000 tonnes of waste reduction – July 2023**

The business case will use REAMIT data from continual monitoring of sensor data for identifying/saving potential food waste and subsequent analytics to understand patterns of food waste in NEW with justification for saving 40000 tonnes of food waste.

22.18

- **WP Communication**

UR from NTU started giving updates about WP Communication package activities. What regards communication WP deliverables, the Communication Strategy Document will be available by January 2023. This document had been prepared initially with some elements and is being continuously updated. We are continuously adding events and improvements to

this document every six months. Also, the website has been updated. Every week, SB adds new content to our social media platforms. There are also many posts made and publicized on a regular basis.

Moreover, UB currently learns how to prepare policy briefing document. She will share the draft with everyone by the end of this year and will take feedback from everyone. This will be submitted by January 2023. There are also reports on REAMIT networking events. Most of deliverables are ready except Policy Briefing (which will be drafted by December 2022). Journal articles have been prepared to a great extent too. RR will talk more tomorrow afternoon. NTU has already prepared three articles (deadline for which was July 2023).

WP Communication Objectives include a few objectives. First, to have an influence on agribusiness so it decreases amount of food waste in food supply chains by 10% by 2023. Second, to raise awareness of the potential from combined technologies. Third, to convince agribusiness users of the value of REAMIT's technologies (aimed at reducing Risk) and increase knowledge.

News regarding the REAMIT project go beyond the EU and UK.

What relates to our role within the project, NTU remains mainly responsible for WP communication. In addition, we are also involved in preparing of the journals and other articles. Our role includes also: in close co-operation with the Project Coordinator/Lead Partner as well as project partners, we co-ordinate the process of designing of the project's communication strategy. We also co-ordinate the implementation of communication activities. We manage REAMIT's web space and social media and liaise with JS and Lead Partner on project/programme communication.

There are several ways of communication which will be used in order to engage with the target groups. First, banners about the project and signboard will be installed. Second, project web space will be further developed. Third, exhibitions flyers and posters in industrial and academic events will be prepared and distributed. Fourth, we will use press and media (newsletters, TV programmes, promotional video, web articles to promote the project through local business. Journal articles will be presented at annual conferences.

Currently, Rich is involved in creating Videography. Rich was brought in the project with the help of UU.

Rich introduced himself. He said he makes videos for 21 years. He has made music videos, documentaries and has worked at the UU in the past two years.

Communication Strategy Document has been updated with new activities. First, preparation of the new logo banner, documentary video and communication materials. Second, REAMIT activities were scheduled until June 2023. Third, attendance of networking events from January to June 2022. Finally, the CSD is available in REAMIT SharePoint.

SB updated about REAMIT website activities. REAMIT website domain has been secured in 2019 – [www.reamit.eu](http://www.reamit.eu). The original Interreg North-West Europe project page for REAMIT is still live at: <https://www.nweurope.eu/projects/project-supply-chains-by-minimising-waste-using-big-data-and-internet-of-things-sensors/>. Both websites are regularly updated with news articles, the information about events as well as new communication materials. In this period (January – June 2022), so far there were 943 visits, compared to 516 visits in the previous period. SB asked everyone to give their thoughts and feedback.

RR mentioned that he shares and promotes [www.reamit.eu](http://www.reamit.eu) during every event he takes part in and encourages others to promote it as well. He also encouraged others to visit the website once every month.

Also, three newsletters have been published during this period (since December 2021). Currently, we are preparing newsletter for July 2022. The Mailchimp Newsletter subscription platform has seen growth in engagement by 12% in this period. We urge partners to share newsletters regularly as well as to contribute to upcoming newsletters.

Case Studies have been developed for the pilot-tests. WD Meats (UK) is still in progress; Picnic (NL) is still in progress; Human Milk Foundation (UK) – will be completed in August/September 2022. Yumchop (UK) has been completed; and Burns Meats (IR) is still in progress.



Moreover, multiple REAMIT partners contributed to a special issue of the journal ‘Sustainability’. Also, a paper for the ICT 2022 conference has been accepted.

SB updated about project banners, posters and flyers. Promotion materials created so far include animated video, roll up banner, brochure, newsletter, posters, leaflet, REAMIT partner video, infographics and large format (A2) vehicle magnets. Also, there will be new animated videos for pilot tests (Picnic and WD Meats), and new posters (Picnic, WD Meats, IGRECA).

New material developed in this period January to July 2022 include: newsletters published in January and March, five posters for pilot tests (HMF, Yumchop, BioGros, Musgrave and Cyberbar), new graphics and digital development of the REAMIT website, photos and video footage of pilot test visits, new logo banner, REAMIT documentary video being developed.

So far, posters created include: HMF, Yumchop, Musgrave (not published), WD Meats, Cyberbar at UCD, Raman spectroscopy at UoN, IGRECA and Levstone (all completed). In progress, we are still waiting for approval for Picnic and BioGros. New pilot tests will require posters for: VDH Group, Burns Meats, Musgrave, HMF, Raman, Levstone, Cyberbar – this has also been discussed.

What’s more, a documentary is being filmed by Rich Osborn at Type40 Creative and will be broadcasted on a local TV channel. So far filmed interviews and pilot tests during visits at Yumchop, HMF, Picnic, University of Essex, BioGros and Whysor.

In August 2022, there are plans to film at: NTU, BED, I & R, UoN/Valorial, other partners (a confirmation from RR needed). Final documentary video will be completed before the end of 2022.

RR requested SB and Rich for video captured at UoN and requested UoN to facilitate this. RR also asked I&R if they are interested in getting such video filmed at their premises. SB showed video of REAMIT documentary. RR mentioned that he wanted representation from every partner in the video.

Regarding policy briefs, the objective for us is to contact local councils and food associations to disseminate REAMIT work. For example, SEMLEP is a local organization within South East Midlands of UK. SEMLEP and UoB are connected to communicate about REAMIT. The deadline for this deliverable is listed as January 2023. UR mentioned that she is trying to identify what should be part of the Policy Document. Different countries have different policy requirements. The idea is to draft a common set of policies. It would be short document and UR requested help from partners for its completion. She requested partners to share (if they have) any associated documents.

Reports on REAMIT Networking Events have been presented in newsletters, this is also reported to JS through REAMIT project report. REAMIT partners participated in more events. On 28-29 January 2022, International Conference on Science, Engineering & Technology (ICSET – 2022) took place. On 26 March 2022, Mayor’s Climate Action Event – Residents’ Fair took place. On 25 May 2022, the Research Day of College of Business Administration in Ajman University (UAE) took place. On 11-12 May 2022, Food Waste Fest 2022 took place. On 21 June 2022, Race to Zero – Decarbonization Conference for Food and Drink Manufacturing took place.

Regarding communicating through local communication channels, active participation has been encouraged through supportive approach of production of short news. Local channels and online networks could help communicating to disseminate REAMIT to all local stakeholders. NTU contacted partners individually and sent a template to partners. Partners have continued their efforts to actively communicate about the project, mainly through the use of social media channels.

What relates to REAMIT’s presence in social media, NTU actively posts and engages on social media by posting minimum once each week on both REAMIT platforms. External publications include: a feature in the Nottingham Business School Newsletter, a press release on REAMIT by the University of Essex and NTU representing REAMIT through the Food and Drink Forum. What’s more, our REAMIT twitter account has seen a 25% increase in engagement in this current period. There were 52 total retweets and 106 total likes on twitter.

RR requested everyone to support WP Communication team in their work.

SB took the group picture of online meeting.

KP joined the meeting. She will present the BED progress report after the tea break.

[Tea break 15 minutes]

Day 2. Thursday 7th July 2022 – Morning Session

22.19

#### **Project extension (9:00-9:05)**

RR said that redeveloping the extension, drafting the budget, and getting it approved by the Joint Secretariat has now been completed. As of the end of May, the updated budget is officially included in the REAMIT application form. As of now, we are in the extension phase. The latest application available in the EMS has all the details of the extension. If anyone needs any official information, please direct your office to the EMS portal. No one had any questions.

22.20

#### **REAMIT Steering Committee Meeting**

22.20.01

RR reviewed the minutes from the previous meeting.

Action log resulting from RAC/WP/RSC meeting, 19-20 January 2022

<b>Date</b>	<b>Minute/ Item</b>	<b>Action identified</b>	<b>Responsibility</b>	<b>Status: Confirmation of completion or reasons for non-completion</b>
19/01/2022	22.03	As REAMIT is still recruiting companies, all partners are requested to keep approaching companies for pilot tests.	AI PPs	Completed
19/01/2022	22.04.03	UoN to document all the experiences with the Raman pilot test, including experience when approaching companies for pilot tests, in a story telling format to be used in future publications.	UoN	The draft is ongoing. Completed
19/01/2022	22.04.04	Whysor to document all the experience with the pilot test with Picnic in a story telling format to be used in future publications.	Whysor	BioGros is ongoing. Completed. The deadline is March 2023

				Some drafts need to be sent. GlanAfric stopped.
19/01/2022	22.04.05	Whysor to document all the experiences with the pilot test with VHG in a story telling format to be used in future publications.	Whysor	Completed
19/01/2022	22.04.06	Whysor to document all the experiences with the pilot test with Biogros in a story telling format to be used in future publications.	Whysor	Ongoing
19/01/2022	22.04.07	NTU to document all the experience with the pilot test with Glen Affric in a story telling format to be used in future publications.	NTU	Ongoing
19/01/2022	22.04.08	UU to document all experience in the Dry Aging Chamber pilot test with WD Meats in a story telling format to be used in future publications.	UU	Completed
19/01/2022	22.04.09	UU to document all experience in the Clostridium Bacteria pilot test with WD Meats in a story telling format to be used in future publications.	UU	Ongoing
19/01/2022	22.04.10	UU to document all the experience with Musgrave pilot in a story telling format to be used in future publications.	UU	Ongoing
19/01/2022	22.04.11	BED to document all the experience with Yumchop pilot test in a story telling format to be used in future publications.	BED	RR asked if KP has started this work.  This document is not ready yet.  Remind KP to submit it. Ongoing.



19/01/2022	22.04.12	UCD to document in a story telling format how ideas at UCD developed for fresh box and proof of concept pilot tests; how these ideas evolved and what actions were taken to implement them. Please include names of all companies that have been approached to participate in these experiments.	UCD	Not completed.  RR asked for the possibility of fresh boxes.  Ongoing
19/01/2022	22.04.13	UU to document in a story telling format how ideas at Ulster, BED and Whysor developed for 3DF pilot tests; how these ideas evolved and what actions were taken to implement them (input from Matthias, Gypsy's experiments, SensipDx, etc.). Please include actions taken and names of companies that have been approached (manufacturers of 3DF sensors suggested by Tahmina) to advance the work on 3DF pilot test.	UU	Completed  Keep sending a draft time to time.
19/01/2022	22.04.14	BED to report in a story telling format experience with the pilot test with HMF.	BED	We have already provided posters.  Completed
19/01/2022	22.05.03	BED, Whysor, Levstone and data analysis partners to determine whether a separate manual is needed on how the Whysor server is connected to REAMIT Big data server.	BED, Whysor, Levstone	Ongoing
19/01/2022	22.05.04	Levstone and pilot test leads (HMF, Picnic, Musgrave, etc.) to meet and discuss if the Blue maestro system proposed by Levstone would be beneficial for them.	Levstone, Whysor, BED and Ulster	Ongoing
19/01/2022	22.05.06	UoN to make sure that data from the Raman pilot test is transported to the Big Data server at BED.	UoN	Data is coming to the server.  Connectivity issues.  Completed.

				Ali to check it. RR suggested an additional analysis.
19/01/2022	22.05.09	Data analytics partners to go beyond time series analysis and move to predictive analytics (rather than descriptive).	BED, MTU, SenX, UU	Ongoing
20/01/2022	22.08	NTU to present policy brief examples from other projects supported by Interreg NWE Programme.	NTU	Ongoing RR suggested James to invite NTU in WP3 (in September/October)
20/01/2022	22.08	NTU to present ideas for policy briefs in REAMIT.	NTU	Ongoing
20/01/2022	22.08	NTU to advance work n 6 case studies.	NTU	Ongoing
20/01/2022	22.08	NTU to advance work n 4 case studies.	NTU	NTU will do 4 Whysor will support 2 more
20/01/2022	22.08	NTU with support from partners to propose (and develop) actual videos on REAMIT (not only animated).	NTU	AA to start special issue paper James can do some research on Bacteria  Completed
20/01/2022	22.08	NTU to explore and implementing a new functionality on the REAMIT website: add a log in button to access the Big Data server.	NTU	Ongoing

20/01/2022	22.08	UU to present to the team the documentary video made at UU.	NTU	Completed
20/01/2022	22.08	PPs to communicate about REAMIT through social media platforms.	PPs	Ongoing RR is encouraging everyone to support
20/01/2022	22.11	All PPs to include minutes from internal meetings in Project Handbook in SharePoint.	PPs	Ongoing All minutes should be put in the SharePoint for all WPTs

The minutes have now been confirmed and actions have been reviewed.

The feedback from RAC meeting and the decisions of the WP meetings will be discussed and approved after discussion during RSC meeting.

No feedback has been received so far. RR asked if any significant decision was taken in the WP meetings yesterday. No input was received. RR asked AA for updates.

22.20.02

#### **Calendar for 6<sup>th</sup> REAMIT project activity and finance report and payment claim (July – December 2021)**

KP is not around. To be revisited later when Kate returns to the meeting.

IH showed an email, saying ‘There was an email sent by KP. By 17 June 2022, partners have completed the narrative part of the progress report in eMS and shared it as a pdf file with partners. By 15 of August 2022, partners have completed audits of their progress and finance reports’.

22.20.03

#### **Plans for the 8<sup>th</sup> meeting of RAC/WP/RSC: UCD will be the host. 11-12 January, Wednesday – Thursday 2023**

RR encouraged PP at UCD to start planning in the next 2-3 months. The menu should be started, and hotels, flight options, and relevant information should be prepared to be shared with partners in advance, in the next two to three months. The date for the upcoming meetings are confirmed for 11-12<sup>th</sup> January 2023. RR encourages partners to participate in person

but will also provide hybrid mode. RR has requested for UCD team to provide the best travel information ahead of time for the trip to Dublin.

22.20.04

**Calendar for the 7<sup>th</sup> progress report – the narrative part of the progress report should be completed by 17 June 2022.**

Final deadline for financial reporting is 15 August 2022. All dates have been confirmed as per Kate's email to partners about deadlines.

22.20.05

#### **Plans for the final meeting in March 2023**

All tasks should be done until March and should be wrapped up until March and the rest of the time is administration. Date has been confirmed for 22<sup>nd</sup> March 2023. This will be a wrap up of the project. No financial spend will happen after March 2023. RR hopes for us to complete the Special Issue articles by then.

22.20.06

#### **Plans for the 4th and REAMIT Symposium in December 2023**

AG from Valorial provided the update on Symposium planning. It will take place on 6<sup>th</sup> December 2022, and will be a one-day format. It will be a hybrid format, including both attendees online and speakers in Nantes. The plan for the day is following: the event will follow a conference format + B2B and round table discussion.

9-11:30 GMT – session on REAMIT

1-4 PM GMT – session for European Commission and industry.

The desire is to have 60-100 attendees. Organisers shall be Memona and Adrienne from Valorial. In addition, Gael and Gladys from I&R will support Valorial.

Memona is working on the organisation of the symposium. She is in charge of digital communication. Last year, she was an intern at Valorial. She organised our yearly event last year with over 300 participants so is a good fit for the job.

#### **Plan for organisation of the Symposium**

July – September 2022: work on a collective overview of the topic to address; a call for proposals for the speakers. Adrienne wants to work collectively with the consortium to decide what we want at the symposium and help to finalise the program.

September: confirmation of speakers; reservations including B2B platform and finalising who will be joining in Nantes as we will be planning a visit for in-person partners.

October – November 2022: communication about event and languages it should be communicated in - management of networks and participants. Valorial will work with SB on this. RR requested to display the documentary on multiple screens at this event. Also, he asked for each pilot test lead to make a presentation at this event (10 minutes each). RR requested posters to be displayed at the event. Finally, all partners attend the symposium in person as it will be the best time to meet. RR proposed to create a plan amongst ourselves for what we want to present ourselves. We have 2.5 hours for the project on the agenda.

RR requested partners to be proactive in submitting work to showcase to others what we have done in the project. The event will be a nice networking opportunity too. 60-100 participants is a reasonable number to target. With Valorial/I&R's connections we should do a nice job. AG requested that each partner promotes the symposium through their own channels since it is a hybrid event. In the afternoon, we will plan topics to catch the attention of the target groups (from pharmacology to flowers; policy makers etc.)

SB asked if all speakers needed to attend in person or whether speakers could join and present online too. AG said that we should be flexible to allow speakers to attend in person and online (to allow for example the EU Commission, pilot test companies, etc., to join). However, all REAMIT members should attend in person.

KP commented saying that it is good that the event in Nantes will have a hybrid format. Also, she emphasized to consider what the aim of the event is, especially because it will happen 6 months before the end of the project. Thus, in her opinion, we should create content to fulfil the aim, including the rollout of sensor technologies to different industries/sectors. If this is the aim, then, we should consider who the target audience is. What's more, there should be different businesses from these sectors, and we should think how we can convince businesses to use sensor technology to enhance their businesses. We should therefore define the aims, target groups, and show them what they will get from it. Another issue is what we expect from EU Commission if they are attending. This is a very important actor and we can make good use of their attendance if we have a clear objective. We can ask them for help to take REAMIT further. Lastly, since REAMIT is closing and we are thinking about the legacy of the project, perhaps we could invite investors: to let them see what we are doing, to see if they are interested in investing in REAMIT ideas. There are some VC's in France who may be interested. AG will have a meeting with 1 or 2 of them to narrow down the focus of the Symposium.

RR has requested that Valorial starts preparing a flyer for the symposium.

22.20.07

## **REAMIT Legacy**

This includes: combining Interreg grant with venture capital to help further develop REAMIT technologies, developing and following up project proposals inspired by REAMIT, setting out a spin out company, etc.

22.20.08

### **REAMIT Risk Log**

KP joined the meeting and started talking about the risk log. The risks with Levstone, UoN, and SanX relate to the amount of funds and the output. KP said she was interested to explore it in a more detail.

UoN is expected to go through a real-life experiment. Levstone has not progressed as much as it was expected. SanX is still under progress. There might be a need for an audit from the funder in case if it is required. The major risk is to not to offer the Pilot Test Companies what has been promised.

KP explained that a student has already designed an application with certain amount of money allocated (around EUR 30k). However, she said, the Levstone application is old.

RR suggested Davinder to add a REAMIT logo to the application.

KP added a few comments related to the REAMIT legacy. She has already talked with the funder, but she has not received a response. She is looking for some potentials.

Whysor and Levstone are interested in continuing the technology. IH explained that they are not in direct contact with clients, so they do not have the capability to contact all the companies and a company needed in between and they do not install sensors. They work mainly on hardware and software.

The amount of funds that intelligent farm uses depends on the number of users and the technology, etc.

22.21

### **11:15 Research studies from the REAMIT project**

RR asked James to talk for 10 min.

James started talking about research and publication works. UU started five research works. The research combines the WD and Burns meat and focuses on a generic case study. As for the case study paper on Musgrave, this is in progress and the abstract was written. Also, the poster has been prepared. There is a review paper with Xavier on sensor technology, and it is ongoing.

James is working on a survey paper with the outline of pilot trial companies. Quantitative research will be added to Yan's research. By December there will be draft information about this paper.

YD started her presentation, but there was a technical issue on screen share.

SA spoke about her research papers in progress. She works on two review papers and one conference paper. The papers relate to IoT and sensors in the food supply chain. SA has already sent emails to Abi and Natalie. She also showed her contribution in the collaborative paper with XC and TC.

RR suggested SA to make sure that there is no overlap between papers and check if they are distinct from other research works.

TA confirmed that all that is written in SA's paper is based on her effort and her own word, in addition to the point that was raised by UR regarding concerning similarity issues.

[Break for 15 min]

YD started her presentation: 'Examining the influences of Ability, Trust, Opportunity, and Motivation on IoT sensors adoption for preventing food waste'.

YD explained that there is ongoing research focusing on IoT sensor adoption. It is expected that more reviews will be added to the model.

RR asked TA about her plans. TA explained that she attended the STFC food network at the end of the last month. Also, she investigated the micro toxins that affect spices, nuts, peanuts, etc. She decided that this was a fantastic opportunity to collaborate with colleagues in that area. She is going to write an article on Micro toxins. RR suggested TA to collaborate not only with academics but also with businessmen in this area.

RR asked UR to show and explain the poster. UR started her presentation.

UR explained a case study. TC, XC, and KP provided information on this case study related to the HMF case study.

UR explained the case study. She asked for help from TC, and XC related to the case study.

UR asked GS if he is available in August to add some inputs to the case study. She is going to make a change to a diagram.

She will send an email to James related to the WD Meats case study.

RR started talking about additional articles. He explained that there is an ongoing research on the behaviour of pilot test companies. He is preparing a paper related to the opportunities and what is the motivation of the companies to work in this area. He investigated the importance of top management. He is working on another paper too. It aims to explain that each food item is different.

22.22

- **WP Project Management**

KP explained WP project management as follows:

- DM 1.1 Project Handbook  
Updates on calendar for the 7<sup>th</sup> progress report  
Minutes of REAMIT meetings  
Stored in SharePoint
- Dm 1.2 Minutes of meetings of RAC/WP/RSC  
RAC/WP/RSC meeting (January 2022) and Action Log
- DM 1.3 Intermediate Work Package coordination – partnership meetings  
RAC/WP/RSC meeting in January 2022  
Over 20 online meetings of monthly WP T1, monthly WP T2, WP T3, bi-weekly sub-group, BED-UoEssex team  
Over 20 bilateral meetings between PPs

There were several meetings between project partners.

**Reporting calendar:**

- By Friday 17<sup>th</sup> June 2022 – partners have developed their activity report in EMS and shared it with all partners and Associated Partners
- By Mondays 15<sup>th</sup> August 2022 all partners have finalised their FLC audit and submitted to the Lead Partner their certified progress and finance report, payment claim, and forecast of expenditure for the next period
- On Thursday 8<sup>th</sup> September 2022, on the spot FLC audit of BED and REAMIT project will take place in the Luton campus

An eMS is shown and there is a cumulative cost issue. FLC funds are requested to be sent to the funder.

RR said that for the first time UoEssex is going to send such kind of information. He also said he would work with KP on this issue.

IH explained her experience on showing the technologies, posters, etc.



KP suggested to clearly show the timesheets for the REAMIT related works to separate from other activities.

Regarding long-term plans, RR emphasised the REAMIT symposium and the policy briefing in March 2023.

Deliverables as per the Application Form include the following:

- Network prospectus (January 2019 – July 2023)
- REAMIT three networking events (by July 2021)
- The agreed framework for measuring the impact of REAMIT technologies on food waste (by December 2019)
- Policy briefings (6, by March 2023)
- Cross-sector briefings (3, by June 2023)

Most of the deliverables have already been completed.

22.23

### **WP Long Term**

RR explained there is an idea of expanding REAMIT idea in other areas, for example, vaccine supply chain or flower supply chain where the temperature control is needed. IH also suggested its applicability in the transport of blood.

RR suggested research on these areas. He suggested the following: pharmacy, livestock transport, fuel transport, cosmetics, industry, blood supply chains, flowers.

YD commented that as there is less than one year left, and as deadlines are coming in March 2023, more meetings are needed and leaders are asked to chase up the partners.

KP shared her observations regarding some of the funding that has not yet been used. Also, BED considered employing some research associates (Elias Eze, Marina).

TA suggested that Gipsy could also collaborate in case that funds are available.

RR suggested that underspent funds could be allocated for publication not only in 'Sustainability' but other journals too.

TA suggested IH that if they are interested, they could collaborate on a publication.

Finally, SB took a photo of all participants.

RR thanked all partners for their contributions to the project and closed the meeting.

**End of Day 2 of RAC/WP/RSC meeting.**

**Action Log: Actions resulting from RAC/WP/RSC meeting (January 2022 and July 2022)**

<b>Date</b>	<b>Minute/ Item</b>	<b>Action identified</b>	<b>Responsibility</b>	<b>Status: Confirmation of completion or reasons for non-completion</b>
19/01/2022	22.04.04	Whysor to document all the experience with the pilot test with Picnic in a story telling format to be used in future publications.	Whysor	BioGros is ongoing. The deadline is March 2023 Some drafts need to be sent. GlanAfric stopped.
19/01/2022	22.04.06	Whysor to document all the experiences with the pilot test with Biogros in a story telling format to be used in future publications.	Whysor	Ongoing
19/01/2022	22.04.07	NTU to document all the experience with the pilot test with Glen Affric in a story telling format to be used in future publications.	NTU	Ongoing
19/01/2022	22.04.09	UU to document all experience in the Clostridium Bacteria pilot test with WD Meats in a story telling format to be used in future publications.	UU	Ongoing
19/01/2022	22.04.10	UU to document all the experience with Musgrave pilot in a story telling format to be used in future publications.	UU	Ongoing
19/01/2022	22.04.11	BED to document all the experience with Yumchop pilot test in a story telling format to be used in future publications.	BED	RR asked if KP has started this work. This document is not ready yet. Remind KP to submit it. Ongoing.

19/01/2022	22.04.12	UCD to document in a story telling format how ideas at UCD developed for fresh box and proof of concept pilot tests; how these ideas evolved and what actions were taken to implement them. Please include names of all companies that have been approached to participate in these experiments.	UCD	Not completed.  RR asked for the possibility of fresh boxes.  Ongoing
19/01/2022	22.05.03	BED, Whysor, Levstone and data analysis partners to determine whether a separate manual is needed on how the Whysor server is connected to REAMIT Big data server.	BED, Whysor, Levstone	Ongoing
19/01/2022	22.05.04	Levstone and pilot test leads (HMF, Picnic, Musgrave, etc.) to meet and discuss if the Blue maestro system proposed by Levstone would be beneficial for them.	Levstone, Whysor, BED and Ulster	Ongoing
19/01/2022	22.05.06	UoN to make sure that data from the Raman pilot test is transported to the Big Data server at BED.	UoN	Data is coming to the server.  Connectivity issues.  Completed.  Ali to check it.  RR suggested an additional analysis.
19/01/2022	22.05.09	Data analytics partners to go beyond time series analysis and move to predictive analytics (rather than descriptive).	BED, MTU, SenX, UU	Ongoing
20/01/2022	22.08	NTU to present policy brief examples from other projects supported by Interreg NWE Programme.	NTU	Ongoing  RR suggested James to invite NTU in WP3  (in September/October)

20/01/2022	22.08	NTU to present ideas for policy briefs in REAMIT.	NTU	Ongoing
20/01/2022	22.08	NTU to advance work n 6 case studies.	NTU	Ongoing
20/01/2022	22.08	NTU to advance work n 4 case studies.	NTU	NTU will do 4 Whysor will support 2 more
20/01/2022	22.08	NTU to explore and implementing a new functionality on the REAMIT website: add a log in button to access the Big Data server.	NTU	Ongoing
20/01/2022	22.08	PPs to communicate about REAMIT through social media platforms.	PPs	Ongoing RR is encouraging everyone to support REAMIT communication team and activities
20/01/2022	22.11	All PPs to include minutes from internal meetings in Project Handbook in SharePoint.	PPs	Ongoing All minutes should be put in the SharePoint for all WPTs
06/07/2022	22.14	All pilot test leads to fill in the template for pilot test story telling.	BED	Ongoing
06/07/2022	22.15	Whysor to install sensors at VHG, start measuring the pressure, create a poster, write the pilot test storytelling, and analyse data.	Whysor	
06/07/2022	22.15	Whysor to complete the pilot test storytelling of VHG.	Whysor	
06/07/2022	22.15	Whysor to link the data received from Picnic to the data that is coming from the sensors to see if it	Whysor	

		is possible to recognize a trip in the data.		
06/07/2022	22.15	BED, MTU and SenX to start the analysis of data for Picnic.	BED, MTU, SenX	
06/07/2022	22.15	BED, MTU and SenX to determine a cooling profile for cool box.	BED, MTU, SenX	
06/07/2022	22.15	NTU to produce Picnic poster and the video.	NTU	
06/07/2022	22.15	Whysor to complete the pilot test storytelling of Picnic.	Whysor	
06/07/2022	22.15	Whysor and data analytics partners to define the thresholds in which the temperature is correct for each part of BioGros warehouse.	Whysor and data analytics partners	
06/07/2022	22.15	Whysor to complete the pilot test storytelling of BioGros.	Whysor	
06/07/2022	22.15	UoN to complete the pilot test storytelling of Raman Spectroscopy.	UoN	
06/07/2022	22.15	UoN to conduct stage 3 of the pilot test in real life conditions in a truck.	UoN	
06/07/2022	22.15	UU to perform two more runs of tests with WD Meats when different combinations of temperature and humidity parameters will be tested to try to reduce the dark facings.	UU	
06/07/2022	22.15	UU to complete the pilot test storytelling of Raman Spectroscopy.	UU	

06/07/2022	22.15	UU and BED to determine whether Clostridium Bacteria pilot will be analysed further under the REAMIT project or outside it.	UU, BED	
06/07/2022	22.15	UU to discuss with UoN whether and how Raman spectroscopy can be used for this type of analysis. UU to send some samples for testing at UoN.	UU, UoN	
06/07/2022	22.15	UU to complete the pilot test storytelling of Clostridium Bacteria.	UU	
06/07/2022	2.15	NTU to recover equipment installed at Glen Affric.	NTU	
06/07/2022	2.15	NTU to complete the pilot test storytelling of Glen Affric.	NTU	
06/07/2022	2.15	BED to complete the pilot test storytelling of HMF.	BED	
06/07/2022	2.15	BED to complete the pilot test storytelling of Yumchop.	BED	
06/07/2022	2.15	UCD to complete the pilot test storytelling of Burns Meats Farm.	UCD	
06/07/2022	2.15	UU to complete the pilot test storytelling for 3DF sensor.	UU	

06/07/2022	2.16	Levstone to send any extra data parameter required for the app development as it may differ from modelling data requirements.	Levstone	
06/07/2022	2.16	JE to arrange a meeting with GS and tech team to ensure consistent data labels.	JE	
06/07/2022	2.16	Levstone to develop REAMIT specific App.	Levstone	
06/07/2022	2.16	Levstone to develop a second database for potential demand points.	Levstone	
06/07/2022	2.16	SenX and data analytics partners (and Whysor) to integrate SenX system for data analytics with Whysor API approach.	SenX and Whysor	





# APPROVED MINUTES FROM THE 8TH MEETING OF REAMIT ADVISORY COMMITTEE, WORK PACKAGES AND STEERING COMMITTEE MEETING, 11 – 12 JANUARY 2023 HOSTED BY UNIVERSITY COLLEGE DUBLIN, IRELAND

## Attendees:

Name	Institution	Name	Institution
Ram Ramanathan (RR)	Essex	Jean-Charles Vialatte (JV)	SenX
Katarzyna Pelc (KP)	BED	Fionnuala Murphy (FM)	UCD
Sahar Ahmadzadeh (SA) online	BED	Shane Ward (SW)	UCD
Tahmina Ajmal (TA)	BED	Tamiris Da Costa (TC)	UCD
Gael Maugis (GM)	I&R	Xavier Cama (XC)	UCD

Davinder Bola (DB)	Levstone	Omar Dib (OD) online	UoN
Gautam Samriya (GS)	MTU	Imke Hermens (IH)	Whysor
Usha Ramanathan (UR)	NTU	Marcel Steegh	Whysor
Sasha Bennett (SB)	NTU	Tom Verstraten (TV)	Whysor
James Gillespie (JG)	UU	Herve Rannou (HR)	SenX
Joan Condell (JC)	UU	Ali Assaf (AA)	UoN
Trevor Cadden (TC) online	UU	Elaine Ramsey (ER) online	UU

## Day 1. Wednesday 11 January 2023 – Morning Session

### 11:00 - 11:30: REAMIT Advisory Committee meeting (Chair BED)

Kate presented the progress of REAMIT project in the past 6 months: July – December 2022. She made the overview of progress across all Work Packages.

WP T1: the aim was to establish connections with a minimum of five companies, and this goal was exceeded because a total of nine companies were successfully contacted. Ten functional prototypes have been developed, with nine utilising temperature and humidity sensors, and one utilising Raman spectroscopy. Furthermore, there is an additional Bluetooth sensor currently in the development stage. However, there have been some difficulties with the implementation of some pilot tests, mainly staff changes at Picnic and no personnel at Ruthiau dedicated to the Raman pilot test, which challenged communication with pilot test companies.

WP T2: Whysor developed a dashboard to monitor the temperature and humidity. It used the automatic data transfer.

WP Communication: a brochure, a new REAMIT timeline, four new posters, a documentary, six short videos, six posters and six case studies were all made. The policy brief document is still work in progress. A few public events were organised. In December 2022, Valorial, with the support of Images et Réseaux and the REAMIT partners, prepared and hosted a symposium in Nantes (France). Also, partners jointly completed 14 journal articles and, further, submitted them in November 2022 to the special issue of *Sustainability Journal*. P

WP Management: Project Handbook has been updated with the minutes from all the meetings. It is available in SharePoint. Minutes of the recent RAC meeting hosted by Whysor in July 2022 as well as action log have been shared with all partners. When it comes to intermediate work package coordination, BED and University of Essex facilitated over 30 online meetings and supported work package leads. BED is currently working on Project progress report 4.1 and 4.2. The Joint Secretariat has approved a permission for small budgetary changes in the REAMIT AF for MTU and BED. LP partner was informed that we have a new project officer at JS of Interreg NWE Programme since December 2022. Her name is Maelle Lebon.

One risk has been, mainly that NTU partners have experienced challenges with obtaining back REAMIT IoT equipment from Glen Affric, who decided to disengage from the REAMIT pilot test.

WP Long Term: REAMIT partners (MTU and UU) have approached four new business organisations. Valorial organised 4<sup>th</sup> REAMIT Symposium in Nantes, France. Ram (University of Essex) has initiated a discussion on the legacy of the REAMIT project with some ideas for developing REAMIT 2 project proposals. Finally, Ram developed a successful pitch for a spin-off company inspired by REAMIT and won £8000 from Essex Investment Fund to further develop ideas inspired by REAMIT.

Also, during the RAC meeting, Annemarie Van Vilsteren, as a guest speaker, presented their proposal on the reduction of food waste and invited REAMIT partners (from the eligible area) to join the team developing that project. The project proposal, which will be submitted to Interreg North Sea Region Programme, has three main objectives: to mitigate food waste in the supply chain for vegetable, dairy, and marine products; to promote collaboration and innovation within the food industry; to conduct research on tools that can be utilised during food production to identify areas for optimisation, with the goal of not only reducing food waste but also making the food industry more competitive. The project proposal foresees submissions from up to 30 projects, with at least two or three companies working together.

#### **11:30 – 13:00: WP T1 Pilot Tests (Chair I&R): Adapting and pilot testing sensor technologies in agri-food supply chains**

Gael started by presenting an overview of the deliverables that Images et Réseaux have already submitted. First, publication of open call (March 2023) (D1.1). Second, it organised a partner workshop on sensor and Big Data (June 2019) (D2.1). Third, it worked on a test roadmap (March 2023) (D2.2). Finally, it recruited minimum five companies from agri-business supply chain for pilot tests (July 2020) (D1.2).

By March 2023, Images et Réseaux aims to submit a few other deliverables (as per the extension, to be completed by 17 March 2023). This includes working prototypes using sensor technology (D3.1), user manual for each pilot test (D3.2), and report on the pilot test and development of the sensor prototypes (story telling template) (D3.3).

Gael shared the link to access the document regarding the above-mentioned deliverables. He encouraged everyone to access the document and add their contribution in the document before mid of March 2023. Gael explained also that he exchanged several emails with partners regarding the above-mentioned deliverable. If something still seems unclear to partners, they are welcome to approach him, although, as he believes, partners should have some more clarity now.

Partners presented updates on the pilot tests.

### **1) Picnic (NL)**

Imke from Whysor started a presentation on pilot test with Picnic (NL). As she explained, Picnic is an online supermarket that delivers groceries to the customer's home. They use trucks to transport groceries from their fulfilment centre in the Netherlands to local hubs and from the hub to the customers' homes. Picnic started with four delivery vehicles in 2015 and now there are over 1000 vehicles in the Netherlands and they deliver groceries in 120 Dutch cities and villages.

As Imke explained, they faced several challenges during the pilot test with Picnic. First, there was a problem with real-time data reporting/monitoring during transportation; second, sustainable sensor housing; third, the personalised cooling profile; and, fourth, easily maintainable equipment. Eventually, Whysor applied the REAMIT solutions to resolve these issues. The team at Whysor installed 20 Elsys EMS sensors (temperature, humidity and acceleration) in Picnic food crates and established a system facilitating real time transmission of data having temperature, humidity and acceleration information from the food crates in delivery journey to a Whysor cloud-based database where further data analysis can be performed.

After the installation of sensors in 2021, data were coming in fine, however, within a few weeks all the sensors stopped sending data. The sensor housing appeared to be not solid enough to withstand the force of heavy groceries. As a solution, flexible rings were 3D printed to protect the housing of the sensor and 20 new sensors were purchased and installed. Few months later, Whysor noticed that all these sensors broke down again, which means that the sensor housing is probably still not strong enough. This experience from the pilot test with Picnic allowed drawing a few conclusions. First, technical specifications of the sensors meet the expectations. Second, protection of the sensor is challenging. Finally, we need to track broken sensors.

Deliverables that have been submitted for this pilot test include:

- Poster – done
- Case Study – not started
- Working prototypes (3.1)
- User manual (3.2)
- Story telling (3.3)

Imke mentioned that the deliverables 3.1, 3.2 and 3.3 are currently in progress. In past few months, Whysor has not been hearing any communication from Picnic despite having tried many times. However, just before Christmas 2022, Picnic got in touch with Whysor. Picnic updated Whysor that they were having organisational movements of staff and, thus, our initial point of contact in Picnic no longer worked in the same department. Picnic expressed a desire to continue and complete the pilot test with REAMIT. Whysor discussed with Picnic a possibility of installing 10 new sensors with new housing in January 2023. Picnic agreed, but they also emphasised that they would have to first look internally for the relevant personnel in Picnic to be in charge of the pilot test. Picnic also agreed to share extra data for some trips that Whysor could identify or define. Based on this, next steps in the Picnic pilot test include installation of ten new sensors in January 2023, defining trips for which we want extra data from Picnic for analysis, and defining cooling profile and looking for anomaly detection.

Ram commented that it is a good development and expressed happiness that Picnic wants to complete the pilot test with us. Ram also mentioned that with further progress on the pilot test in coming days, University of Essex can work together with Whysor team on the Picnic case study. He also welcomed contributions or inputs from other partners for the case study. Imke also expressed willingness to work together further on the case study. He mentioned that they are working with three types of protective rings for sensor housing too, but Whysor is unsure about the longevity and lasting capability of these protective covering of sensor.

Ram asked if Whysor is planning trips in coming days. Imke replied that they would plan trips in summer months as the observations are more interesting and relevant then, compared to the winter time.

Ram added that apart from establishing sensing and monitoring system, finding personalised cooling profile and estimating amount of cooling ice packs for the food crates is an important objective of this pilot test. For this purpose, Ram mentioned that finding temperature gradient during delivery journey seems important and he seeks support from other partners to look into it based on incoming data. Ram thanked Imke for her presentation.

Elaine asked if we are capturing the cost of technology used in the pilot test. She commented that it will be important from a business perspective and for cost benefit analysis of using these technologies for the company.

Ram commented that although not actual cost, but through work in LCA we are capturing cost equivalents in terms of environmental impact of using these technologies. He also suggested Tamiris to work further on capturing the actual costs along with environmental cost equivalent. During the discussion, the group commented that we could calculate the costs associated with technologies without much difficulty as we know prices of various components purchased. Ram asked Kate if she could help with it as she has already dealt with ordering sensors and other components. Tahmina also emphasised the need to capture cost related to battery usage and server.

Kate made the point that we need a systematic approach or template to do such cost benefit analysis. She also added that she recently came across an interesting paper regarding cost and benefit of using IoT technology in companies. She said that a cost benefit analysis can be made with pilot test companies, such as HMF, by doing interviews with them and capturing the benefits and challenges they faced. Kate would share the research paper with partners. The group then made an observation that having such template and systemic approach though very useful from business perspective, is a big task in itself.

**Action: Whysor with support from university partners (UEssex) to develop a case study document on the pilot test with Picnic.**

**Action: Whysor to install ten new sensors in Picnic in January 2023, to define trips for which we want extra data from Picnic for analysis, and to define cooling profile and look for anomaly detection.**

**Action: Whysor and BED to gather information on the prices of various components that were purchased. This could help to calculate the costs associated with the use of technologies (in addition to the environmental cost calculation).**

**Action: Kate to share with partners a research publication on costs-benefits analysis of using IoT technologies by companies.**

## **2) BioGros (Luxembourg)**

BioGros is a wholesaler of high-quality organic and biodynamic foods in Luxembourg. BioGros is a company with a complete supply chain. They have fresh vegetables such as celery, lettuce and mushrooms produced by organic farmers from the cooperative. The products are transported from the farmer to the BioGros warehouse by vehicle trucks. The vegetables are packaged and then transported to retail in small village shops, etc. BioGros sometimes experiences quality issues in transporting fresh foods, and they wish to gain insights into climatic conditions there. The goal of this pilot test is to gain insight into climatic conditions like temperature and humidity in the complete supply chain and then, particularly, regarding several fragile vegetables like mushrooms, onions, potatoes, and celery roots. The company also would like to have more information on fruit and vegetables ripening inside the warehouse.

Whysor faced several challenges during the pilot test with BioGros. The first issue related to real-time data reporting/monitoring during transport. Second, real-time data reporting/monitoring during warehousing.

Third, alerting system in case of anomalies. Fourth, alerts should not be sent when trucks are stationary. Fifth, easily maintainable equipment.

The REAMIT solution involved setting up architecture includes installing sensors at BioGros grower, warehouse and inside the trucks. The sensors selected are digital meter Eagle loggers with temperature and humidity sensors. Data is transmitted from the Lori to the Whysor cloud. Whysor tested connectivity in Luxembourg at two locations and found it to be fine. Whysor also tested battery life and used trip detection algorithm to enhance battery life. The initial conclusions from the pilot test demonstrated that technical specifications of sensors meet expectations, the system is robust and false alerts are avoided.

Deliverables for the pilot test and their status are the following:

- Poster – already done
- Case study – work in progress with NTU
- Working prototypes (3.1) – work in progress
- User manual (3.2) – work in progress
- Story telling (3.3) – work in progress

The next steps for this pilot test include two aspects. First, Whysor will meet with BioGros, the REAMIT analytics team and writers of the case study for discussion and brainstorming for additional questions to be asked and looked into, as well as additional information needed. Second, we are working on defining the anomalies with analytics team at REAMIT. They already held two such meetings and the next meeting is planned this month (January 2023).

**Action: Whysor, the REAMIT analytics team and writers of the case study will meet with BioGros to further discuss other relevant issues that need to be explored and gather some additional information.**

**Action: Whysor and the REAMIT analytics team will continue to work on defining the anomalies.**

### **3) Pilot test with Raman Spectroscopy with Routhiau, IGRECA, ADRO in France (UoN)**

Omar (University of Nantes – UoN) started presenting progress update on Raman spectroscopy-based pilot test at UoN. The main aim of the pilot test is to test the use of a portable Raman spectrometer inside food delivery trucks as a means to continuously measure and monitor the quality of food samples in the delivery trucks, as well as alerting the truck drivers/stake holders in case of food quality getting degraded during the road trip.

The pilot test has been divided into three stages.

- Stage 1 – Lab development (test the system in lab and develop the required scripts)
- Stage 2 – Transitioning between lab and company (portable system placed in refrigerated chamber in trucks mimicking real transport conditions)
- Stage 3 – Test in real conditions

The Stage 1 included setting up Raman sensors in lab and testing on food samples. It then involved analysing the observed data using Matlab scripts and uploading the results and scripts to the server. The Stage 1, including all the sub-activities, has already been completed.

The Stage 2 included all the activities of Stage 1, and, additionally, the activities related to system modification, automatisisation, simulation as well as validation. All the activities of Stage 2 have already been completed.

Omar demonstrated the results of Stage 2. The system was able to monitor the change in quality of meat samples as we go from Day 0 to Day 30 during our observation period. The system was able to distinguish between high quality and low-quality food samples. The system was also able to detect when the first shift in quality of food samples took place. In addition, the system was also able to detect the molecules that were impacted during change in food quality. For example, the system was able to detect impact on molecules of Tyrosine and Amide 1, which are good indicators food quality.

Stage 3 (test in real conditions) has been divided into two activities. During the first activity, UoN team tried to contact industry such as Routhiau company for testing in real conditions. However, they did not hear back further from them, thus, the team engaged with the other activity – renting a truck. UoN team rented a truck and placed portable Raman sensor-based system in the truck for taking the measurements. The system was installed with foams to protect it from shocks and held tight using rope and the system was tested. The next phase of this activity will be to test the system in journey, and this is planned to take place at some point in February 2023.

Omar also emphasised that they exchanged communication and, eventually, got an interest from Vivo Group (in France) to install Raman sensor-based technology on their premises. The REAMIT team visited Vivo Group during the REAMIT Symposium in December 2022. Their concern is to test quality of sea food before/while transporting it to other customers. UoN plans to discuss it further with the company.

UoN has also published a research paper on Raman Spectroscopy Application in Food Waste Analysis in a special issue of *Sustainability Journal*. Moreover, UoN is preparing a poster for a conference on Raman



Spectroscopy which will take place in Brest (France) in January 2023. Omar shared the draft of the poster. UoN is also working on developing the Storytelling (Deliverable 3.3) and user manual (Deliverable 3.2).

Ram commented that the opportunity for using Raman spectroscopy-based food quality analysis with Vivo Group, which has already had a sophisticated technical system in place, seems like a good development, because it strengthens the usability of Raman spectroscopy for such use case.

Devinder asked Ali how long it takes for Raman spectrometer to detect quality of food sample. Ali explained that it measures the quality in less than a second, but we need to measure spectra at multiple locations on the food sample. Ali made the point that using baseline spectra, they can compare spectra of sample in real time and can generate alert for the operator if the spectra indicate change in food quality. Ali also added that Raman spectroscopy works better in cold temperature because noise is reduced in low temperature. Thus, it could be very useful for cases such as Vivo Group. Ali made the argument that Raman spectroscopy can also be used for fruits, vegetables and other food items in addition to meat, chicken, fish and seafood products.

**Action: UoN will test the portable Raman sensor-based system in journey in February 2023.**

**Action: UoN will further explore the possibility to collaborate with Vivo Group and will discuss installing Raman sensor-based technology on their premises to test quality of sea food before/during transportation to other customers.**

**Action: UoN to develop the Storytelling (Deliverable 3.3) and user manual (Deliverable 3.2).**

#### **4) Pilot test with YumChop (UK)**

Sahar from the University of Bedfordshire (BED) shared the updates on the pilot test with YumChop in the UK. First, she gave a brief overview of YumChop as a company. YumChop is a British-based family-owned company specialising in producing ready-to-eat frozen meals with African flavour sold through self-serviced automated vending machines. YumChop also delivers directly to customers' homes through purchases made on website, and also to retailers and large organisations.

Sahar updated that REAMIT team visited the company and installed sensors at various locations in YumChop such as different zones, freezers, cold rooms, vending machines and kitchen fridges. Sahar explained the system requirements for YumChop, in particular, types and number of sensors and gateway used during installation. There have been ten sensors deployed in the pilot test, and one sensor has been deployed per fridge/freezer. The acceptable temperature threshold defined by the company is -18 degrees Celsius in a

freezer. If the temperature exceeds this threshold, alerts need to be sent to company owners. A proposed analysis that we are working on is early anomaly detection model.

Sahar explained that team is looking into the factors that could potentially affect the temperature of raw materials or processed food in a fridge. The danger zone refers to the temperature range in which bacteria grow most rapidly on food. The maximum temperature should be 5 degrees Celsius. For consumer foods, generally, if the food is exposed to temperature range above 5 degrees Celsius for more than 90 – 120 minutes, the food should be disposed due to the growth of pathogens. Some other causes of food degradation could be that food not cooked or reheated to the temperature required, or hot food is not cooled properly before being placed in cold storage, the fridge is not cooling as per the requirements to keep the food in safe zone. Thus, it is important to check the temperature regularly. Other aspects that we can look into include the impact of seasonal variations and using it for benefit. For example, there could be an increase in energy consumption during summer period as compared to winter. Also, with increased temperature monitoring, we can look for optimising the energy cost by avoiding scenarios such as desired temperature cut-off is -20 degrees Celsius, but food is kept in -30 degrees Celsius, causing extra consumption. We can also carry out a time series analysis of food waste in YumChop, before and after sensor installation.

Some of the plans that we are currently investigating are to optimise routes for reaching a set of vending machines, optimising the journey lengths, correlation between maximum journey lengths and outside temperature, alternative routes based on traffic information as well as the amount of ice packs/dry ice needed in trucks. Other updates can be provided in WP T2 section.

**Action: BED to prepare a story telling document on YumChop.**

## **5) Pilot test with Human Milk Foundation (BED)**

Sahar (BED) presented updates related to HMF (<https://humanmilkfoundation.org/>) pilot test. First, she gave a brief overview of HMF. Human Milk Foundation, founded in 2017 in the UK, is a charity working to help more families feed their babies with human milk.

The goal of the pilot test is to monitor temperature in which human milk is transported between a donor, human milk bank, hospital and home; and send alerts if these conditions change. Optimal temperature for transportation of human milk is -20 degrees Celsius. In general, there are 30 – 50 donors per day. For milk deliveries, generally a few bottles of milk are transported per trip in a motorcycle or a car. We have prepared a poster for HMF pilot test highlighting collaboration of REAMIT with HMF. Sahar showed draft of poster.

Sahar then gave a brief overview of sensor installation infrastructure deployed for the pilot test. Sensors monitor the temperature and send the data to cloud database where data is analysed. Whysor has built a

dashboard for displaying data from HMF sensors. There were some challenges faced during the pilot test. There was an issue related to the connectivity between sensors and the cloud, as the sensors move from one location to other of varying connectivity, sensors loose connection with the cloud. Whysor is working with HMF team to resolve this connectivity issue. Also, another connectivity issue was due to communication breakdown. There were also some challenges related to alarming.

We are analysing the data coming from the sensors and we are monitoring temperature fluctuations over a period of time. Data analytics partners are also looking into the issue if we need other data also for the pilot test apart from regularly analysing the available data. BED also plans to purchase new sensors for HMF. The Whysor team is also working towards improving the dashboard by adding new features such as configuration for binary sensors.

**Action: Whysor and the HMF team to resolve the issue of connectivity between sensors and the cloud as well as the communication breakdown, and alarming.**

**Action: BED to purchase new sensors for HMF.**

**Action: Whysor to improve the dashboard by adding new features such as configuration for binary sensors.**

## **5) Pilot test with WD Meats (Dry aging chamber) in the UK (UU)**

James from UU presented updates related to the pilot test with WD Meats for dry aging. WD Meats wanted to optimise the dry aging process that they deployed on their premises. Dry aging beef is a premium technique used for the flavour development and to tenderise the beef. It involves hanging beef carcasses or hindquarters in a refrigerated room uncovered and left to age for several weeks or even months at a controlled temperature, relative humidity, and airflow. It is costly because of high aging shrinkage, trim loss, risk of contamination, and the requirements of aging conditions and space. REAMIT project is interested in reducing trim loss, which is a phenomenon that occurs when too much moisture is extracted from beef resulting in unusable dark facings (which needs to be trimmed and disposed of before the sale of the meat). UU is trying to reduce the dark facings and, thus, trim loss, by tuning the environmental parameters of the refrigeration setup.

The REAMIT team deployed four LoRaWan sensors and a LoRa gateway in four zones of the dry aging chamber to monitor and record the temperature and humidity data. The equipment selected includes a multi-tech Lora Gateway, and four Uralink UC11 temperature/humidity sensors. Two sensors were installed at the front of a large, refrigerated lorry container with all the hindquarters hanging up, and two were installed at the rear of the lorry.

The team performed three dry age trials, two of 14-day cycle and one of 21-day cycle in July 2021 (three weeks), March 2022 (three weeks) and August 2022 (two weeks). Normally, the dry aging process lasts three weeks.

James presented some results from the trial. A histogram of temperature values of left placed sensors was presented to look for most recurring values of temperature. Also, the temperature profile of dry aging chamber from front to back, over a period of 14 days. Since July 2022, one more dry aging cycle was performed and it lasted 14 days.

For next steps, James is waiting for Marco to provide start and end weights for April and August 2022 trials. The plan is to ideally perform one more iteration with different structuring of carcass's/sensors or different temperature and humidity parameters for the refrigeration unit after results from the baseline trial will be suggested. There are two questions to explore: (1) Does airflow affect dark facings? Airflow depends on how many carcasses are located in the trailer and also the structure. (2) Are there more optimal parameters which exist for the temperature and humidity which would minimise the dark facings while avoiding harmful bacteria formulation? Another idea is to compare this study with Burns Farm Meats pilot test data, this will be discussed in WP T2.

**Action: Once WD Meats provide start and end weights for trials that took place in April and August 2022, James will try to perform one more iteration with different structuring of carcass's/sensors or different temperature and humidity parameters for the refrigeration unit.**

## **6) Pilot test with WD Meats (Clostridium Bacteria) in the UK (UU)**

James provided a background of the pilot test. This pilot test has proven to be tricky to kick off, partly due to the need of highly specialised knowledge of microbiology and some logistic issues. Clostridium is an anaerobic spoilage-causing bacterium found on farmyard or animal hide and has a high prevalence in abattoirs. It is a multi-billion-dollar problem because it produces non-toxic gases which spoil products early. In addition, it can spread easily and only grows once the products are packed.

Currently, WD Meats do swabbing with PCR in a lab based at the University of Bristol, which takes at least 48 hours and sometimes 72 hours. As WD Meats are processing tons of meat per time, they are hoping to find a quicker way of detecting it so that they can clean up the factory quicker, which means fewer products are affected. The trial plan is to investigate alternative methods of detecting the bacteria using a trace source of Clostridium using DNA sequencing. The goal is to find a faster method of detection, allowing for immediate

clean-up of surfaces when detected that will inevitably reduce the beef waste in abattoirs, retailers and homes.

James provided an update about the current progress in the pilot test. UU met with Marco and Victoria (lab technician at WD Meats) on 3 May. They have purchased their own PCR machine (Genesig), which processes samples in approximately three hours rather than 48 hours, what WD Meats had experienced before. However, they had some issues with calibration. UU will help them with calibration/benchmarking and device validation using positive Clostridium DNA strains and comparing results between their lab and UU lab PCR machine to ensure their machine is functioning correctly. James Dooley also prepared ten samples of positive/negative Clostridium DNA and delivered to WD Meats on 4 August 2022.

WD Meats ran those ten Clostridium samples and sent their results. UU ran the Clostridium samples but only three rather than ten. We are awaiting for James Dooley to write a technical report which would further explain these results. The results between these two runs should match. WD Meats are having recurring issue with their positive/negative controls for Clostridium. James Dooley is going to investigate this and see if he can produce new controls for them to use in their Genesig machine. However, James updated that James Dooley has been very busy in past six months and it has been difficult to contact him and to progress further on this since past six months. Thus, we may need to redo another set of experimentation. James showed results of sample runs by WD Meats and UU. James Dooley shared his initial comments on the results and mentioned results of UU were along expected lines, however, more insight on these is needed.

For the next steps before the end of the project, we have to complete a technical report on Clostridium results. We also look to prepare new controls for WD Meats and ensure that their lab can replicate the same results as UU lab. James Dooley also wants to perform a DNA sequencing study to identify the source of the Clostridium. Marco is very interested in this research because he suspects that a lot of Clostridium is coming from imported cattle and WD Meats brings in a lot of their beef from the UK, and he would like to identify the exact suppliers and farmers for where these issues occur. DNA sequencing could help in proving that this is the case and then WD Meats can change the supplier.

**Action: UU to help WD Meats with calibration/benchmarking.**

**Action: UU to complete a technical report on Clostridium results.**

**Action: UU to prepare new controls for WD Meats and ensure that their lab can replicate the same results as UU lab.**

**7) Pilot test with Musgrave in the UK (UU)**

James gave a brief background of Musgrave pilot test. Musgrave is the largest wholesaler of groceries in Northern Ireland. They supply one in every four homes. Musgrave deliveries of chilled food produce are performed to various small businesses, fast food restaurants, etc., within approximately 15-mile radius from Musgrave's warehouse, using their own logistics network. Vans performing deliveries are refrigerated, but at present, there is no way of knowing in the cab or the office if the refrigeration units are currently correctly functioning. Breakdowns with refrigeration units can cost the wholesaler full vans of spoiled food. Therefore, they would prefer an alerting system that would let them know of any issues which should be available to both the driver and the logistics staff in the head office, so the van could be redirected back to base loss, minimising the risk of food spoilage.

The sensor system was deployed in the vans of the company to monitor and track temperature and humidity and trip detection algorithm was also implemented. For the current updates on the pilot test, the IoT anomaly detection system was deployed with `Musgrave Marketplace in April 2022 in three delivery vans operating in the greater Belfast area. The system monitors both the frozen and fresh produce refrigeration areas of each van in 5-minute intervals while deliveries are being performed. Logistics staff at the warehouse has been given access to the Whysor dashboard for real-time monitoring of the vehicles and has been added to the alerting service. When no trip is detected, recordings are made and uploaded to cloud every 12 hours. As of now, the batteries have needed replacement once after 180 days in one logger.

For the steps to be completed before project end, the ambient temperature monitoring, results suggest there are problems with the cooling profile of the vans. However, Musgrave have not flagged any issues. We are also looking into the question whether there might be a better sensor location to monitor the ambient temperature. James added that he spoke with a refrigeration specialist who advised placing sensors to monitor 'air on' at the refrigeration unit, which is where air is drawn into after circulating the entire van. He believes this is the most accurate representation of ambient temperature. We would try moving the sensor to 'air on' of the refrigeration unit and see we could get more accurate ambient temperature data.

**Action: UU to move the sensor to 'air on' of the refrigeration unit inside the Musgrave van and to see if more accurate ambient temperature data is available.**

#### **8) Pilot test with Andy Keery (Rent - a - Fridge & Andy Keery Refrigeration) in Northern Ireland & Ireland (UU)**

James updated that in the past two months, he started a small pilot test with Andy Kerry who is CEO of Rent-a-Fridge and Andy Keery Refrigeration in Northern Ireland and Ireland (<https://www.rent-a-fridge.co.uk>). Andy Kerry Refrigeration rents fridges and cold storage to customers in Ireland and Northern Ireland. He is very popular during festival seasons. He works with supermarkets too. Andy is a contact that we got through

Musgrave, for whom Andy works on refrigeration units. Andy manufactures his own portable cold stores and rents them to various clients.

The problem with the company is that there is a potential for food waste in cold storage if equipment failure occurs. James deployed sensors for humidity and temperature & Digital Matter Eagle IoT logger in the company. The company wishes to have a dashboard for remote temperature monitoring in real time and text alerting system to warn if food is at risk of spoilage.

First pilot with the company was at Belfast Continental market between 19 November – 23 December 2022. On 19 November, James installed one Digital Matter Eagle logger with two temperature probes in one of Andy's rentable fridges, hired to Rocket's (a Dublin based burger company) who had a stall at Belfast's continental market. The cold store stayed at the fixed location for the duration of the market. Since the refrigeration unit runs in the cold store 24/7, the logger was hard wired into the fridge's power supply so that sending recording every five minutes was still possible.

James showed some pictures of the deployment in cold storage as well as data observed during the monitoring. From the data, one observation was there was an anomaly at some instant, indicating sudden rise in temperature. The temperature although was still within the threshold limit. Since, this was first trial, alerting system was not deployed then, but this anomaly provides a use case for having alerting system in place for the company.

Second pilot test with the company is for Artisan click and collect food service. It is planned for January – March 2023. On 4 January, James moved the logger into a second cold store destined for a click and collect artisan food service based in the greater Belfast area. The service is due to commence at the end of January. We will see how the monitoring performs.

For future work, Andy updated that he works with a range of clients, including ones outside of the agri-food sector. His past clients include florists, the pharmaceutical industry and wine storing clients. James has asked Andy about the possibility of monitoring some other produce in the future. As James emphasised, this could help us write our 'Business Development' deliverable, but also for future work. Andy generally only knows his clients a few weeks before the rental starts, so he does not know what is coming up yet. Andy also mentioned that he would like to toggle alerting on and off himself from the dashboard since his units are turned off while not in use.

Ram commented that it is good that we have some additional work with the companies, but we have to update them that the project is wrapping up in July 2023 and we can deliver only accordingly.

James replied that he mentioned that to Andy. Ram highlighted that we need to document a key objective of the work with Andy, so he can also discuss the potential advantages of the technological deployment to his clients.

**Action: UU (James) to document a key objective of the pilot test with Andy Keery Refrigeration and to discuss the potential advantages of the technological deployment to his company.**

## **9) Pilot test with Burns Farm Meats in Ireland (UCD)**

Xavier from UCD presented the updates on the current status of the pilot test with Burns Farm Meats in Ireland. Burns Farm Meats is an Irish company recruited by REAMIT partners in UCD in February/March 2022. It is a small family-run business located in Sligo, Ireland. They have their own farm, which also works as an abattoir in Sligo (northwest of Ireland). Their operations include an abattoir, processing of organic meats, and delivery of retail orders to the public.

The company carries out dry aging process to deliver tender cut meat. They are interested in monitoring of dry aging process. Despite the increase in the flavour and tenderness of the meat, the dry aging process is still costly for abattoirs because of shrinkage of the meat, trim loss, and risk of contamination. They have two cold storage rooms in their facilities in which they carry out dry aging. They are interested in having the tools to monitor these rooms as they have detected a loss.

The aim of the pilot test is to monitor temperature and humidity in the cold storage rooms to reduce food waste. The problem they face is a loss of meat during dry aging, affecting parts that have been exposed to the environment for the duration of the process and need to be trimmed off as a result. We are sensing temperature and humidity data in the chambers. The goal of the pilot test is to establish and implement an alerting system that can warn BFM if the chambers exceed safe environmental condition values.

We placed ten sensors ELT-2 in the chamber, having internal antenna sensors for temperature and humidity, and a gateway. Data coming from the sensors is displayed on Whysor's dashboard and is stored in BED Big Data hub. We deployed six sensors in a larger chamber – two closer to the door, two in a central position and two close to the refrigeration unit. 4 sensors are deployed in a smaller chamber – two closer to the door and two close to the refrigeration unit. Xavier shared a screenshot of data display on Whysor's dashboard for temperature and humidity. Some glitches observed in temperature could have happened due to door opening and closing in their regular operation, though it can be due to some anomaly as well, for which alerting system could be useful.

The humidity sensor seems to have a problem as the readings shown by it are too high. The reason behind this might be that moisture is building up in the internal antenna sensors. We plan to validate its readings.



From an analytical perspective, the priority is to ask for weight data from at least one cycle. This would allow to propose restructuring of beef carcasses if differences are observed, and to compare results from WD Meads and BFM.

We also need to work on improving the alerting system. The current system sends alerts also when BFM are working in the chamber (loading, unloading or cleaning) and it is not of help to them. The deployment of binary sensors (door open/closed) will be carried out to improve the alerting system. This would link door status to temperature and humidity readings. Also, there is potential for linking the readings with the Warp10 platform – and incorporate anomaly detection, seasonality analysis and other algorithms.

Next, we are planning to visit to BFM in the next few weeks and deploy a new Eagle logger with humidity probes and binary sensors. An additional Eagle logger will be deployed with a humidity probe (T9602). Two binary sensors will be installed as a means to improve the alerting system. This means that we will use that a more complex and optimised alerting logic.

Ram commented that although having sensors deployed is fine, the final outcome should be to understand the factors that cause the meat to lose weight or get wasted. How are we planning to link meat loss with the temperature and humidity? Xavier replied that their priority was to first establish the monitoring and alerting system in place. However, we plan to suggest them to measure and share with use weight of trim loss and meat and link it with the temperature and weight loss.

Ram agreed that establishing a link between trim loss/waste in meat and the temperature and humidity is important.

Xavier made a presentation about Burns Farm Meats (BFM). BFM Ltd is a family-owned company located in north Sligo, Ireland. Their main activities include farming, operation of an abattoir, processing of organic meats, and delivery of retail orders to the public. BFM is especially interested in the monitoring of the dry ageing process. Despite an increase in the flavour and tenderness of the meat, dry ageing is still costly for abattoirs because of shrinkage of meat, trim loss and risk of contamination.

They have two cold storage rooms in their facilities in which they carry out dry ageing. They are interested in having tools to monitor these rooms as they have detected a loss. Also, REAMIT pilot/scenario including the aim of the pilot, problem, data, and goal was explained to the company.

The aim of the pilot is to 'monitor temperature and humidity in the cold storage rooms to reduce food waste'. The problem was defined as 'a loss of meat occurring during the dry-ageing process, affecting parts that have been exposed to the environment for the duration of the process and need to be trimmed off as a result'.

Also, the data includes temperature and humidity sensor data. The aim is to establish and implement an alerting system that can warn BFM if the chambers exceed safe environmental conditions values.

The equipment selected is presented as follows:

- Tektelic Kona Micro IoT Gateway (Tektelic, Canada)
- 10x ELT-2 Internal Antenna sensors (Elsys, Sweden)
- Bedfordshire Big Data Hub
- Whysor dashboard for real-time data visualisation and alerting



The six sensors in the dry aging chamber were shown. There are six sensors in the large dry aging and four sensors in the smaller chamber. The designed dashboard was presented. There is some anomaly detected and there is an alarming system. 3D representation shows temperature fluctuations.

Pilot current status summary. Humidity reading values have been slowly, but steadily, increasing over time for all sensors. The reason may be that moisture is building up in the Elsys ELT-2 internal antenna sensors. There is a need to validate these readings.

From an analytical perspective the priority is to ask for weight data from at least one cycle. This would allow to propose restructuring of beef carcasses if differences are observed and to compare results from WD Meats and BFM.

Regarding the improvement of alerting system, the current system sends alerts also when BFM are working in the chamber (loading, unloading, or cleaning) and it is not helpful. The deployment of binary sensors (door open/closed) will be carried out to improve the alerting system. This would link door status to temperature and humidity readings. A visit is going to be organised. Also, the goal is to install binary sensors. Jean is working on anomaly detection system.

The next steps for this pilot study include a visit at BFM in the next few weeks and deployment of a new Eagle logger with humidity probes and binary sensors. Also, an additional (Eagle) logger will be deployed with a

humidity probe (T9602). Two binary sensors will be installed as a means to improve the alerting system. James Gillespie and Marco Kull worked on a template forr Elsys ELT-2 that can decode binary sensors. The better controlling of the environment, the bigger amount of food waste to be reduced.

**Action: UCD to visit BMF to install binary sensors (door open/closed) in order to improve the alerting system.**

**Action: UCD to improve the alerting system in Burns Farm Meats pilot test.**

**Action: UCD to visit BFM and deploy a new Eagle logger with humidity probes and binary sensors.**

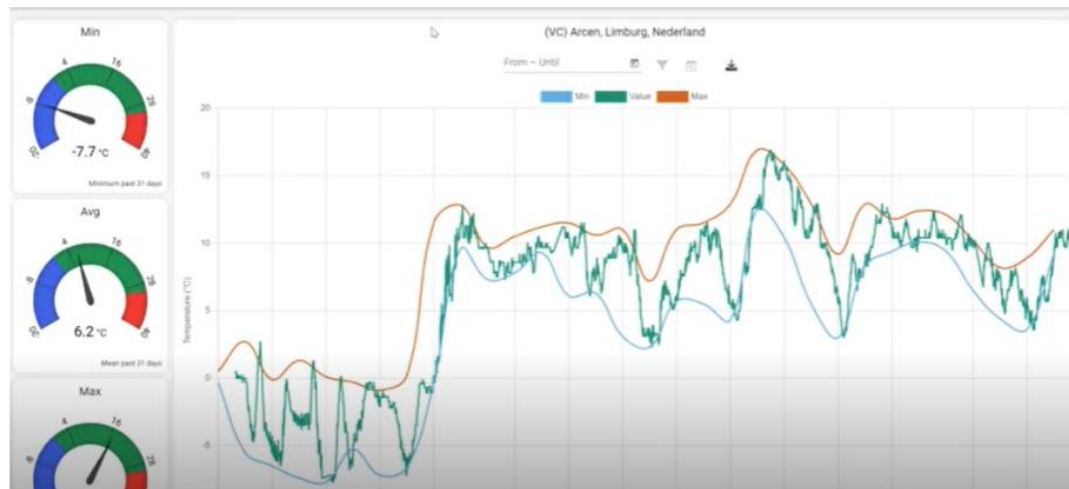
**Action: UCD and data analytics team to ask BFM for weight data from at least one cycle of dry aging process as this would allow to propose restructuring of beef carcasses if differences are observed, and to compare results from WD Meads and BFM.**

**13:00 – 13:45 Lunch break**

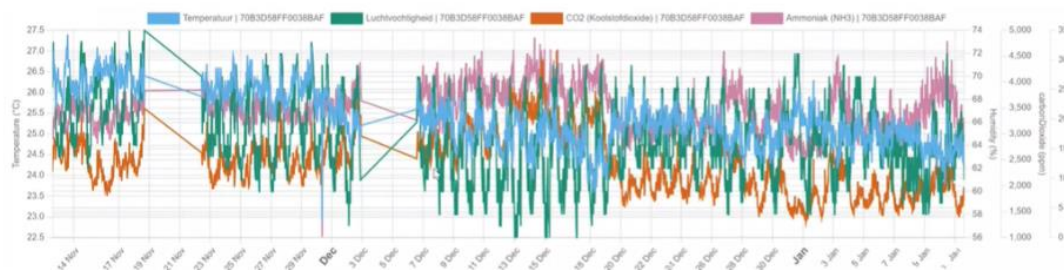
**13:45 – 14:30 WP T2 Big Data integration and application to reduce food wastage**

*Whysor dashboard, graphical data and new features – presentation by Tom Verstraten, Whysor*

TV discussed and demonstrated the new features Whysor is developing for the Whysor dashboard. The designed dashboard can show information of temperature in each selected day.



The designed dashboard can show information of temperature in each selected day.



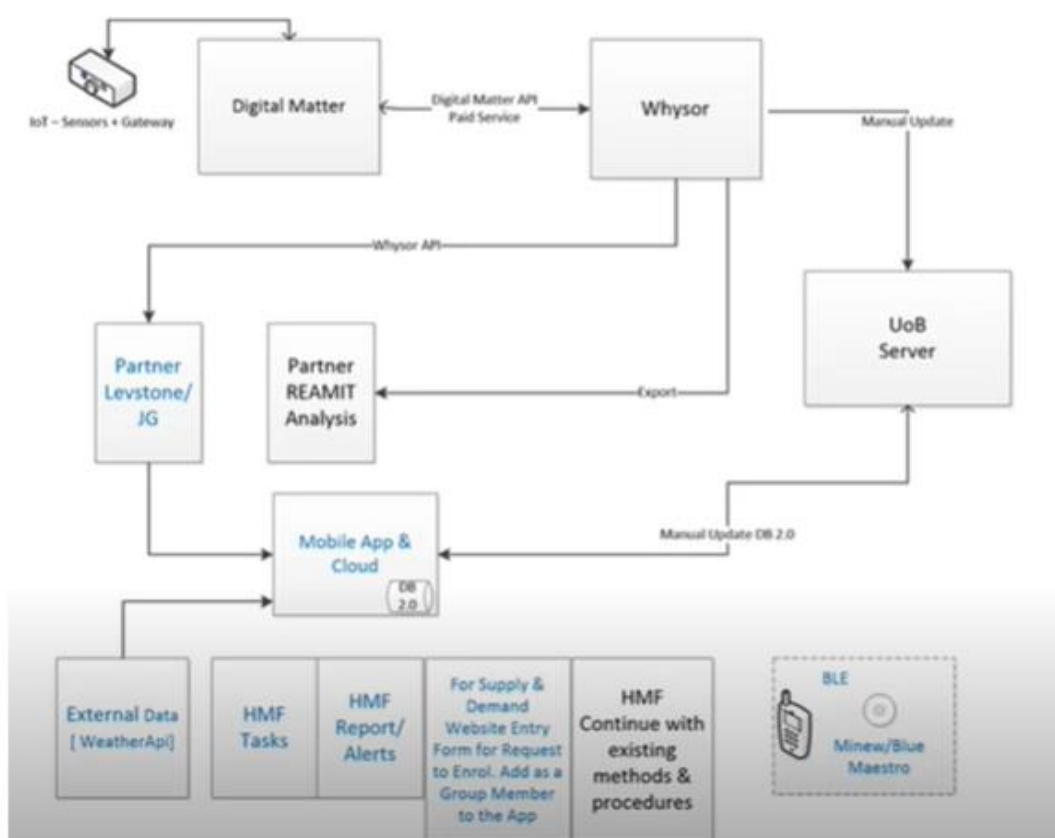
Tom demonstrated also another dashboard and explained that Whysor is working on the data traffic to make it smoother. Tom added grouping data to make it more scalable and improve it. Also, Whysor is working with SenX data and with a new logger (its battery is chargeable).

*Second database of potential buyers, e.g. food charities, convenience stores, etc. the route where trucks would travel (Levstone); Meta data and a Smart Phone APP for REAMIT – presentation by Levstone*

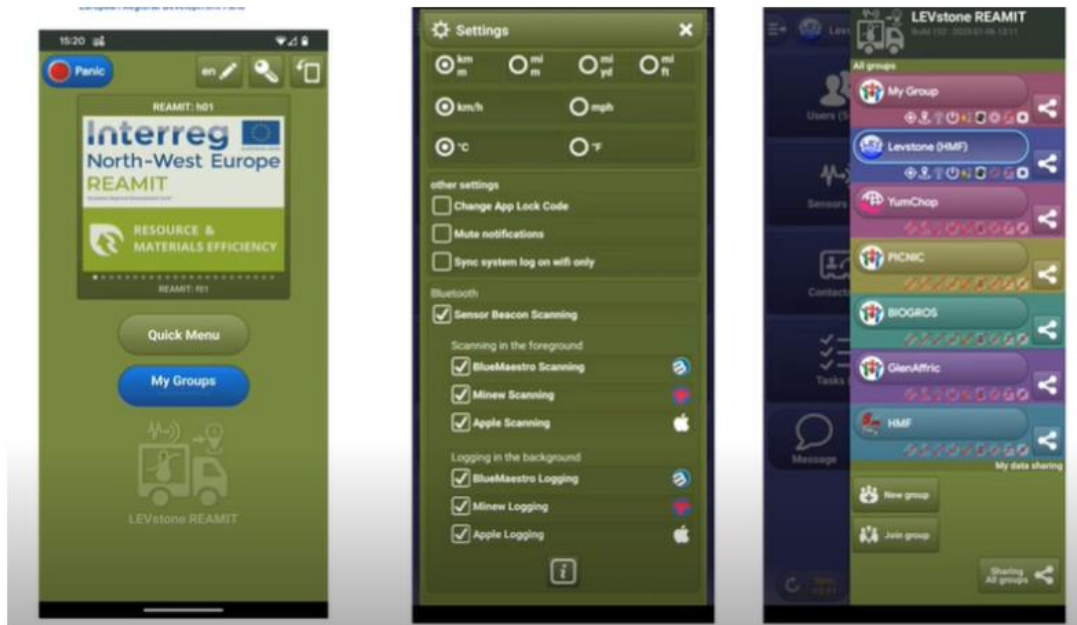
Levstone presented a diagram outlining the progress made and ongoing work regarding the sensors data pathway. They also announced the development of a new application (APP) called REAMIT, which is currently in testing phase, and will be available to partners once it is ready. The APP is multilingual and allows for the addition of Bluetooth devices. Levstone has also developed Blue Maestro scanning, Minew scanning, and Apple scanning within the APP. Access to the APP will be granted through invitations and users will have the ability to share or un-share information such as GPS, temperature, etc. The APP's interface includes features such as users, the diary, notifications, sensors, and a map. An API for weather information has also been

integrated into the APP. REAMIT APP connects to sensors through Bluetooth technology, with a maximum distance of 10 meters for successful connection. Levstone demonstrated how the APP will be integrated with YumChop and MHF.

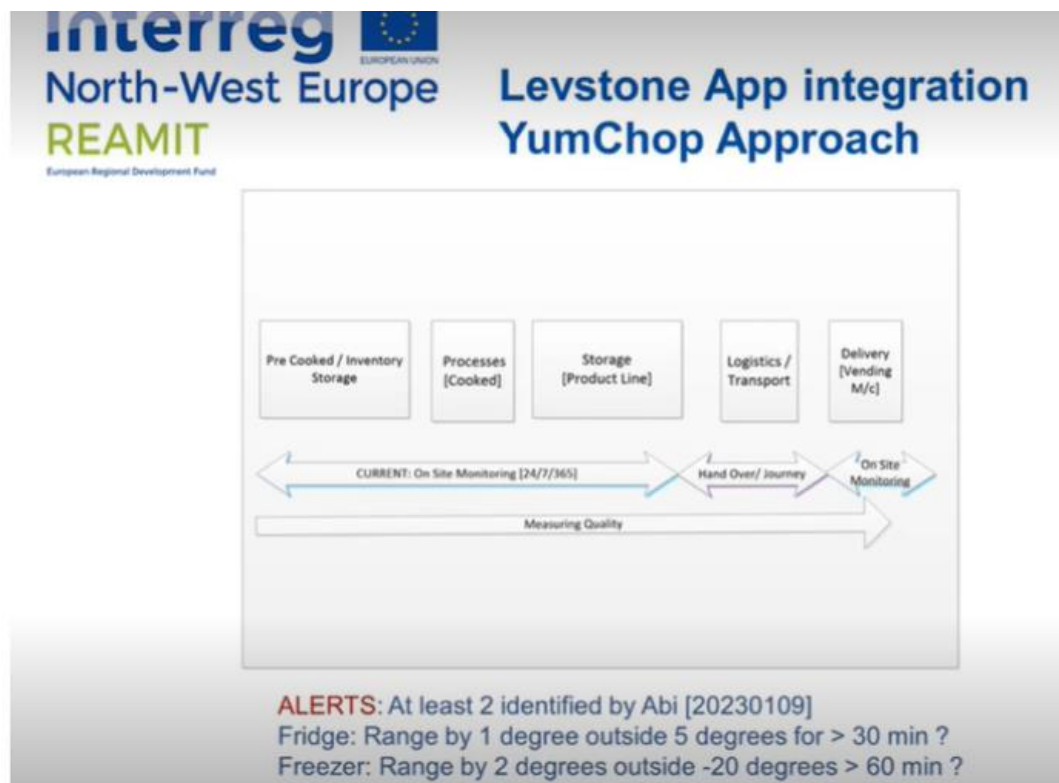
A diagram which represents the application's development was shown.



Levstone is working on demand based system and also developing Bluetooth based application. Davinder presented a demo and showed the functionality of the APP.



There are two technologies. First, Blue Maestro, which is not reliable, and, another technology seems more robust. Davinder explained some issues related to open API, discussed two approaches and showed how the APP can be used for YumChop and HMF.



The data with GPS is integrated.

### Exploring the use of Weather Api to integrate with DB2

**1. Open Weather Api and services. Register with Credit Card.**

**2. Many others providing similar services.**

*e.g. Weatherbit Limitations: 500 per day, not for commercial use, single Api key ...*

**3. Open-Meteo is an open-source weather API with free access for non-commercial use. [www. <https://open-meteo.com/en>]**

Open-Meteo weather forecast APIs uses weather models from multiple national weather providers and combines them to give a more accurate forecast and current weather conditions – To be tested?

Why? Free, Hourly updates, large datasets, for developers: Open Source, easier to access, multiple API services, HTTP based JSON APIs etc..

**4. Met – Office : UK best provider – No ‘middle’ service**



A formula for anomaly detection is represented below.

Anomaly score formula

$$S(t) = c_o * \max(0, t - t_o) + c_r * \max(0, t - c_r)$$

$S$  : anomaly score  
 $t$  : temperature value  
 $t_o$  : orange lower threshold  
 $t_r$  : red threshold  
 $c_o$  : orange range penalty weight  
 $c_r$  : red range penalty weight

#### *REAMIT data analysis of each data analysis sub-group*

SenX presented the latest updates for both pilot tests: BioGros and Picnic. Two sensors (temperature and trip status) were monitored, the first present in cold store and the second in a vehicle. Only sensors from BioGros were monitored since data was available to Whysor. SenX presented the “anomaly detection dashboard”. The aim of this dashboard is to qualify the anomalies (using a specific formula) that can be present in any of the pilot tests. For instance, the temperature can be classified into three categories: 1) RED >8 °C 2); Orange 5-7 °C; and 3) Green 1-5 °C. Regarding the trip status, it can show if the vehicle is moving or not. The future work will include multiple analysis tools, complete live data integration as well as discussion of pilot tests.

MTU discussed HMF data analysis. The goal is to have an automated instant monitoring system which will monitor the temperature during the milk delivery as well as an alerting system which will alert if temperature is going beyond a threshold value. In addition to the latter, a prediction model will be created to know the maximum journey distance and the time for milk deliveries. REAMIT has provided HMF sensors for monitoring the temperature in individual transport boxes. Also, a system needs to be installed to alert the company of any temperature fluctuations.



So far, the results show the following: ten sensors installed in HMF and data from total 99 journeys are available; type of received data includes: time, battery, temperature, humidity, and the status whether bag is open or closed. An additional data such as external temperature, size of the bag, amount of milk and the actual date and time of the journey and its length. Also, HMF data related to rate of change of temperature during several trips conducted in October and March presented also the factors causing such fluctuations. These factors include seasonal variations, external temperature, amount of milk in the bag and duration of journey. Finally, a multi regression model on all data combined (time, milk temperature, bag size, milk quantity, outside temperature and kind of vehicle) shows that a prediction equation has been obtained. This equation can predict the optimal journey length and duration and can find the impact of various external factors that can affect the milk temperature inside the bag.

Regarding the future work, it might be relevant to address the question of the impact of seasonal variations. At what stage do the bag starts warming up after the journey started? Also, based on this data, can we predict maximum journey time and distance? Can use analysis outputs to provide alternative best routes to driver? Another potential work may relate to new models such as neural networks and implementing Statistical Process Control and Process Capability based analysis for HMF data. Finally, use of new source of data such as real time Weather API, GPS and Traffic data leading may lead to wider and more precise analytics.

James Gillespie presented the updates on data analytics for the pilot study with Musgrave. The data set is from April 2022 to November 2022 and spans 180 days. In total, 49,000 data points were recorded, but some were discarded due to the vans being stationary. The remaining data set is 43,563 data points, which is equal to 3000 deliveries. The initial analysis shows that the mean freezer temperature was minus 3.9 degrees Celsius and the mean fridge temperature was 9.05 degrees Celsius. The data was trimmed and reanalysed to exclude journeys that were still in progress after 35 minutes. The mean freezer temperature was still only minus 5.5 degrees Celsius on average, and the fridge was 7.96 on average. It was suggested that the sensor might not be in the correct location and repositioning the sensors will be explored. Also, we checked battery consumption, and plan to have a longer recording every 5 minutes just in the freezer unit in future.

James Gillespie presented the updates on data analysis for Burns Farm Meats and WD Meats. WD Meats and Burns Farm Meats were monitored for weight, temperature, and humidity data during dry aging. Burns Farm Meats has fixed sensors and has been actively monitoring their cold room since September 2022. The data from Burns Farm Meats is consistent with a cold store, but they do not have any weight data yet. The proposed analysis is to examine the differences in drying processes between the laboratory and companies that use dedicated refrigeration for dry aging. The question is whether using a dedicated room for dry aging will result in enough weight loss to justify the cost. The data from WD meats shows an average 4.1% weight loss from carcasses going into dry age, but similar data is needed from Burns Farm Meats to see how the temperature and humidity profiles affect the carcass weight loss. Future work will include study on how to optimise weight loss using before and after weights combined with temperature and humidity data, and potentially suggesting different locations of the hindquarters to optimise weight loss.

UCD made a presentation about BioGros and Picnic. Following the presentations, there are two parameters including Temperature and Trip Status that are more focused on. However, there are some anomalies detected and a formulation for anomaly detection was represented. The formulation was dependent on anomaly score, temperature value, orange lower threshold, red threshold, orange range penalty weight, and red range penalty weight. The parameters in formulation explained above were considered for anomaly detection.

**Action: Data analytics, Levstone and Whysor to develop a system to alert HMF of any temperature fluctuations inside human milk bags.**

**Action: With regard to Musgrave, UU to arrange a longer recording every 5 minutes just in the freezer unit in future.**

**14:30 – 15:30 WP T3 Business development of REAMIT technologies (Chair UU)**

*LCA*

Tamiris Da Costa discussed Deliverable 1.2 (life cycle assessment) in two case studies, WD Meats and Burns Farm Meats. Regarding WD Meats, the last collection of LCA data took place on 3 August 2022. We have collected data for dry aging. We were not able to collect data for the other steps since there was not a lot of information. The livestock production that was collected on the Echo England database. There was a gap between these states. We can try to fill in the literature, but for now we are just focused on this stage “the dry engine”. The data that were collected concerns: the total weight of carcass that are being stored, the water loss, the storage time, the electricity consumption and the number of sensors. The meat production, mainly the part of farming, the hotspot impacted the risk. The only exception is ionising radiation which is the electricity consumption. The sensors and the big data represent just a small contribution like less than 1%. In order to compensate these additional impacts, we would need to reduce at least 236 kilograms of meat.

Regarding Burns Farm Meats, data was collected on 7 September 2022, at all stages of production to final transportation. Data includes the same elements as for WD Meats. LCA results show that sheep has the highest impact. The contribution of the sensors and the big data is minimal. It is insignificant and it is lower than 1%. To compensate for these additional impacts, we need to avoid at least 215 kilograms of meat per year. If we are able to avoid this amount of food, we would avoid the emission of 43,000 kilograms of CO<sub>2</sub>.

**15:45 – 16:30 WP Communication (chaired NTU)**

Usha presented the deliverables that NTU had been working on as part of WP Communication:

- Website launch (by March 2019)
- Social media (by March 2019) – Twitter, Facebook, LinkedIn, YouTube
- Project banners, posters and flyers (July 2022) – these are always updated
- Policy briefs (January 2023)

As for the policy briefs document, Ram and Kate, before the meeting, had shared the ideas on how to improve it. Usha informed that the document was available in the SharePoint and partners could access it and suggest any improvements of the policies.

Regarding REAMIT networking events (December 2022), all of them have been included in the Communication Strategy document. Usha explained that partners were sometimes presenting the project at events but did not always report it to NTU. She asked partners to do so even if such events were outside of the EU to complete the task on networking events before wrapping the deliverable up in April 2023.

Regarding publishing journal articles (July 2023), Usha explained that the REAMIT team was well ahead of time, with eight papers already published and seven are in a proof reading stage. There were going to be at least 15 research papers ready by July 2023.

Usha further discussed the communication objectives. One of the goals specified in the REAMIT Application Form was to influence agribusinesses to decrease the amount of food waste in food supply chains by 10% by 2023. Usha had already approached Ram and Kate about this issue. The question was: is REAMIT influencing the supply chains to reduce 10%, and if not, what needs to be changed? Usha asked partners to think about it and provide comments.

Ram observed that this has become more complicated as pilot test companies were not sharing the appropriate type of information with REAMIT to make such conclusions. For them, often it was a sensitive type of information. Kate suggested that, with YumChop, perhaps some estimates could be made. Ram made the point that companies would happily talk about how these technologies were helping them avoid waste, but not the specific amounts. Kate proposed to collect testimonials from REAMIT companies, actual quotes from them, so that REAMIT could report that it was a sensitive type of data to share, however, the companies tended to provide this information when directly asked about it.

**Action: NTU to collect testimonials from pilot test companies on how REAMIT helps them reduce food waste, given information on actual volume of food waste is often considered sensitive and companies are not keen to share it.**

Usha proposed that another approach could be explaining that after installing IoT sensors, REAMIT companies were achieving 0 waste, although that would need to be evidenced. Usha asked if REAMIT could ask the pilot test companies whether they achieved 0 waste thanks to REAMIT. It was then discussed that the REAMIT team could ask the pilot test companies by email to have a written response from them saying whether they had a significant reduce in waste or not.

**Action: NTU to lead on approaching pilot test companies and asking them whether they had a significant reduction in food waste after installation of the REAMIT approach (e.g. drafting a template email to have a written response from pilot test companies).**

Usha mentioned that she would try to send an email to Abi as she had published a paper with REAMIT team. HMF, Usha added, could also be approached for a testimony. All of that would have to be recorded in our policy document. Usha explained that a background had to be given and explained why the team was creating policies.

Usha asked all authors of journal articles as well as pilot test leads about how REAMIT could create more awareness of the benefits that combining IoT sensor and Big Data technologies could have for agri food companies. It might be another communication objective.

**Action: NTU to facilitate a discussion among the REAMIT consortium about how REAMIT could create more awareness of the benefits that combining IoT sensor and Big Data technologies could have for agri food companies. As an outcome, NTU to produce a brief document with input to the final REAMIT project report.**

Also, REAMIT was trying to convince agribusiness users of the value of REAMIT's technologies (aimed at reducing risk) and increase their knowledge, and, most of the companies have already become more conscious of the benefits.

**Action: NTU to develop a document listing the benefits for agribusiness users from using the REAMIT's approach and technologies, based on input from pilot test companies. Infographics can be used as starting point. This will serve as input to the final REAMIT project report (closure report).**

Usha shared with partners the policy brief document and asked to provide their inputs. She explained that the document was aimed at the beneficiaries of the policy.

NTU identified three different policy opportunities. First, Policy for food producers and manufacturers – Usha mentioned YumChop and BioGros as examples. This policy was further divided into: Sourcing; Diversification and Redistribution – at the start of REAMIT, the aim was, if the food was going to be wasted, to redistribute it. However, REAMIT had not explored/worked on this path, as Usha noted; Data analytics for smart organisation and efficiency; Optimised manufacturing and inventory conditions; and Waste management and redistribution.

Usha explained that, for the work on policy briefings, she was trying to make use of other examples, from other projects or businesses outside of REAMIT.

Second, Policy for food distributors and retailers – some examples were given. This includes: Enhanced traceability via IoT and transparent database solutions, which is possible by optimised warehouse and logistics conditions; and Use of IoT for real-time data driven decisions.

Third, Policy for local authorities. Usha explained that this objective was the most challenging and she was looking forward to inputs from partners. She tried to check in the Nottingham city council for relevant documentation, but there were no such policy briefs. Usha asked partners if they had any policy briefing related to their local council, to share with her. Similarly, searching on Google did not yield many results. She wondered if these types of documents were normally available for public.

Tahmina stated that she had worked with Central Bedfordshire Council in the area of environment. If Usha could forward the questions, she could try to contact them, Tahmina suggested. Also, Joan explained that the business school at UU was involved in secular economy strategy development in Northern Ireland, if that was useful, she could make contact and retrieve some information. Ram explained that he had submitted a document to [parliament.uk/business](http://parliament.uk/business), which would sometimes contain a set of questions they would be seeking to develop policies.

**Action: Tahmina to contact Central Bedfordshire Council regarding policy areas where REAMIT could contribute to.**

Usha explained that she had talked to a PhD student (Zantia) who was working for a food company but they also reported that they had no policy available.

Ram suggested to develop policies using information from all Interreg projects.

Usha went over some points to clarify with the REAMIT team:

- Is there any policy briefing document? (this question had been asked to JS as well)
- Where is it to be communicated and what themes REAMIT want to focus on – role of technology or something else?

Ram explained that the policy briefings were primarily for reporting purposes unless there was an external request for them, and that the document should be shared with REAMIT's stakeholders. If possible, the team could prepare papers or briefings to circulate along with the newsletter, but that it was not possible to send it to real policy makers unless they asked REAMIT to do so.

Kate observed that one of the goals of Interreg's projects is influencing policy-making at the highest level. All of the policy makers are members of committees, Kate explained, and they would be having one on food waste reduction at some point in the future. Kate was going to be sharing the link of the European Commission website as it would be a great opportunity if REAMIT was involved in their meetings.

**Action: Kate to share the link to the European Commission website on food waste reduction policy.**

Usha commented on the fact that the REAMIT team mentioned that IoT was going to be decisive in the future in REAMIT papers, however this was not going to happen unless there was policy in this direction, she observed. She raised a few questions. First, is this document a public document or will be kept only to the REAMIT team and the funder? Second, can we try to formulate the wording of the policy proposal with our REAMIT and other projects alone? Also, who is the audience for this policy proposal and how they will be approached by the REAMIT team to learn about this policy proposal?

Usha asked whether the team should look beyond these projects (outside of Interreg). Kate observed that the team did not know these projects and we did not have access to all the necessary information about them to develop a policy document. From Kate's perspective, it was a matter of identifying a gap in the policy. For example, by speaking with Abi (YumChop), REAMIT learned there was a gap related to refrigeration requirements. Kate added that to propose a policy document, the team could prepare 3 or 4 sentences which would discuss a particular policy gap. Similarly, HMF was also a strong case for proposing a policy. Both Natalie and Gillian were consultants with ministries across the world, for instance. Kate explained that a map regarding human milk banks across Europe, showed several countries with no official regulation. As for audience, Kate said that it was very targeted, e.g. in the second example, policy would be aimed at human banks.

As a conclusion, Ram proposed to conduct a separate meeting in the future with Kate, Joan, Usha, and others to address these points carefully.

**Action: NTU to organise a meeting on how REAMIT can influence policy making. Invitees Usha, Joan, Kate, etc.**

A final remark by Kate was that the work on policy influencing can be very beneficial for REAMIT: once REAMIT is recognised by the big actors as a serious contributor to policy documents, they may be invited to policy making networks, which could include for instance, being informed of the latest developments in a given area, which may stimulate ideas for future projects.

Sasha (NTU) shared with the partners the infographic that had been developed. The work was almost completed but some points still need to be further discussed. Sasha showed some of the items on the timeline, for example: January 2019 – project start; In March there were the first pilot tests in France: Rothiau, STEF, Pescanova. Sasha asked for a list all pilots that had ever started with REAMIT, for example: IGRECA. Ali explained that IGRECA initially showed an interest in Raman but after some time, they became unresponsive; the pilot never really took off.

There were also a few pilot tests that only lasted a limited time and Sasha was not sure whether to include them or not. Sasha explained that all of the photos were linked so they relate to newsletters or relevant documentation on the website.

Some more items on the timeline included:

- The German pilot test Weyers GmbH - which needed to be updated
- The Levstone App - launched in September 2020
- The second symposium hosted by Valorial in November 2020
- 4<sup>th</sup> RAC meeting online hosted by UCD (January 2021)
- Launch of the Whysor Dashboard (February 2021)

Usha asked partners to inform if there were any events missing on the timeline, and if that was the case, to let the NTU team know. Sasha reminded the REAMIT team that she needed all partners to confirm if all dates were correct.

This work, Sasha explained, would be embedded on the home page of the project's website, aimed at showing the journey and it would consist of an interactive document that people could click through.

Sasha asked whether Pescanova or Blue Skies should be mentioned. Ram observed that all companies that REAMIT approached and said yes to a pilot test should be included, even if they cancelled afterwards.

Imke explained that with Weyers (Germany), they actually said no, even though there were talks and discussions at the beginning but ultimately they decided to not participate in the pilot test. Imke said that the infographic should be mentioned that REAMIT had a contact with a German company instead, without

including their full name, keeping it anonymous. Ram agreed on this point as well and added that the idea was to show who the REAMIT team approached and committed to pilot testing.

Sasha would be sending partners the link to the infographic and sharing it also in SharePoint.

As for the last part of the infographic, Sasha presented suggestions for graphs to be included: The number of stakeholders REAMIT reached in each country; number of efficient natural and material resource solutions implemented and tested; and amount of events that REAMIT partners presented at (already up to date in the infographic).

Kate added that the infographic could show which type of actors these stakeholders were (as in the reports in eMS), that information already specifies whether they were national public authorities, local public authorities, academia, business development agencies, etc. Kate could provide this data and use it to create this graph.

**Action: NTU to work with Kate on types of stakeholders approached by REAMIT.**

Kate made the point that the interactions with Inflow (an SME in America), could be added to demonstrate that REAMIT approached actors outside Europe too.

Sasha presented the work on the website, which was regularly updated. She explained that, previously, the website had been hosted by Squarespace, but that it had been moved to GoDaddy which would allow to the website to be live even after the project ended (until November 2027).

Another success relating to the website was that the 4<sup>th</sup> REAMIT Symposium was broadcasted live on REAMIT's YouTube platform which allowed to increase the number of website views during the period. Sasha showed the analytics regarding the views: 1. on the date of the symposium, there was a notable peak during the live broadcast, and a total of 298 views were achieved for the whole of December; 2. for the period July – December 2022, the website had accumulated 923 visits, which was an 85% increase from the previous period.

Ram reminded the team to keep posting on social media channels as much as possible to help increase visibility of the project. Sasha added that it might be good to try sharing newsletters through university channels and local news outlets.



**Action: Partners to keep communicating about REAMIT through social media channels to help increase the visibility of the project.**

Sasha also mentioned that the newsletter subscription platform had seen a 4.3% increase. The next newsletter would be in March 2023, which would be the final or second to last.

The development and publishing of case studies was also mentioned. Ram observed that partners should try to publish more and there were case studies that could still be developed: 15 papers should not be the end of REAMIT's research.

**Action: Partners to develop more case studies and publications inspired by REAMIT.**

Sasha presented the updates on project banners, posters and flyers. A new brochure had been developed for the symposium. Also, five new pilot tests videos were available on YouTube.

The documentary would be made available on YouTube. There were three versions of it: a short 6- minutes versions, a 22-minutes version and a 38-minutes version. Sasha urged partners to help decide which of them was best. Ram asked Sasha to send the links to partners to watch them.

**Action: NTU to send links to REAMIT videos to partners.**

Sasha mentioned the new posters developed in the period July – December 2022: Musgrave and Burns Meats. Also, a new roll-up had been developed for that RAC meeting. All materials were available in SharePoint. Recent events REAMIT partners had participated in and presented had been included in the strategy communication document. The NTU team was also creating a new press release together with NTU's media department. Sasha encouraged partners to follow a similar path and make press releases as well and using the available videos.

**Action: Partners to follow NTU's example and develop press releases about REAMIT.**

Gautam asked about the possibility of including information on each partner of the team (a 'meet the team' sort of section) on the website. It was concluded that that was a section that could be developed in the near future.

**Action: NTU to develop 'meet the team' section on the REAMIT website.**

**Action: All partners to access and suggest any improvements of the policy briefs document.**

**16:30 – 17:30 REAMIT Steering Committee (RSC) meeting (Chair BED)**

Ram Ramanathan reviewed the minutes from the previous meeting. Usha Ramanathan made the argument that there were items in the minutes that may need to be corrected. Ram asked Usha to communicate it to him at a later stage for inclusion in the minutes.

**Action Log: Actions resulting from RAC/WP/RSC meeting July 2022.**

Date	Minute/ Item	Action identified	Responsibility	Status: Confirmation of completion or reasons for non- completion
19/01/2022	22.04.04	Whysor to document all the experience with the pilot test with Picnic in a story telling format to be used in future publications.	Whysor	BioGros is ongoing. The deadline is March 2023 Some drafts need to be sent. GlanAfric stopped.
19/01/2022	22.04.06	Whysor to document all the experiences with the pilot test with Biogros in a story telling format to be used in future publications.	Whysor	Ongoing
19/01/2022	22.04.07	NTU to document all the experience with the pilot test with Glen Affric in a story telling format to be used in future publications.	NTU	Stopped as the pilot test has been discontinued.

19/01/2022	22.04.09	UU to document all experience in the Clostridium Bacteria pilot test with WD Meats in a story telling format to be used in future publications.	UU	Ongoing
19/01/2022	22.04.10	UU to document all the experience with Musgrave pilot in a story telling format to be used in future publications.	UU	Completed and published as a paper in the special issue.
19/01/2022	22.04.11	BED to document all the experience with YumChop pilot test in a story telling format to be used in future publications.	BED	Completed and published.
19/01/2022	22.04.12	UCD to document in a story telling format how ideas at UCD developed for fresh box and proof of concept pilot tests; how these ideas evolved and what actions were taken to implement them. Please include names of all companies that have been approached to participate in these experiments.	UCD	Stopped.
19/01/2022	22.05.03	BED, Whysor, Levstone and data analysis partners to determine whether a separate manual is needed on how the Whysor server is connected to REAMIT Big data server.	BED, Whysor, Levstone	Ongoing
19/01/2022	22.05.04	Levstone and pilot test leads (HMF, Picnic, Musgrave, etc.) to meet and discuss if the Blue maestro system proposed by Levstone would be beneficial for them.	Levstone, Whysor, BED and Ulster	Stopped.

19/01/2022	22.05.06	UoN to make sure that data from the Raman pilot test is transported to the Big Data server at BED.	UoN	Data is coming to the server. Connectivity issues. Completed. Ali to check it. RR suggested an additional analysis. Sahar and Joy to confirm this.
19/01/2022	22.05.09	Data analytics partners to go beyond time series analysis and move to predictive analytics (rather than descriptive).	BED, MTU, SenX, UU	Ongoing
20/01/2022	22.08	NTU to present policy brief examples from other projects supported by Interreg NWE Programme.	NTU	Completed
20/01/2022	22.08	NTU to present ideas for policy briefs in REAMIT.	NTU	Completed
20/01/2022	22.08	NTU to advance work on 5/6 case studies.	NTU	2 from NTU published. BioGros ongoing. Musgrave is published. Picnic, WD Meats/Burns Meat are ongoing.
20/01/2022	22.08	NTU to explore and implementing a new functionality on the REAMIT website: add a log in button to access the Big Data server.	NTU	Stopped.

20/01/2022	22.08	PPs to communicate about REAMIT through social media platforms.	PPs	Ongoing RR is encouraging everyone to support REAMIT communication team and activities
20/01/2022	22.11	All PPs to include minutes from internal meetings in Project Handbook in SharePoint.	PPs	Ongoing All minutes should be put in the SharePoint for all WPTs
06/07/2022	22.14	All pilot test leads to fill in the template for pilot test storytelling.	BED	Linked to 22.08 above.
06/07/2022	22.15	Whysor to install sensors at VHG, start measuring the pressure, create a poster, write the pilot test storytelling, and analyse data.	Whysor	Stopped
06/07/2022	22.15	Whysor to complete the pilot test storytelling of VHG.	Whysor	Stopped
06/07/2022	22.15	Whysor to link the data received from Picnic to the data that is coming from the sensors to see if it is possible to recognise a trip in the data.	Whysor	Ongoing
06/07/2022	22.15	BED, MTU and SenX to start the analysis of data for Picnic.	BED, MTU, SenX	Ongoing
06/07/2022	22.15	BED, MTU and SenX to determine a cooling profile for cool box.	BED, MTU, SenX	Ongoing

06/07/2022	22.15	NTU to produce Picnic poster and the video.	NTU	Poster is completed. No need for a video.
06/07/2022	22.15	Whysor to complete the pilot test storytelling of Picnic.	Whysor	Ongoing
06/07/2022	22.15	Whysor and data analytics partners to define the thresholds in which the temperature is correct for each part of BioGros warehouse.	Whysor and data analytics partners	Completed
06/07/2022	22.15	Whysor to complete the pilot test storytelling of BioGros.	Whysor	Ongoing
06/07/2022	22.15	UoN to complete the pilot test storytelling of Raman Spectroscopy.	UoN	Paper published. Story telling document is ongoing.
06/07/2022	22.15	UoN to conduct stage 3 of the pilot test in real life conditions in a truck.	UoN	Ongoing
06/07/2022	22.15	UU to perform two more runs of tests with WD Meats when different combinations of temperature and humidity parameters will be tested to try to reduce the dark facings.	UU	One has been completed and another is ongoing.
06/07/2022	22.15	UU and BED to determine whether Clostridium Bacteria pilot will be analysed further under the REAMIT project or outside it.	UU, BED	Completed
06/07/2022	22.15	UU to discuss with UoN whether and how Raman spectroscopy can be used for this type of analysis. UU to send some samples for testing at UoN.	UU, UoN	Ongoing

06/07/2022	22.15	UU to complete the pilot test storytelling of Clostridium Bacteria.	UU	Ongoing
06/07/2022	2.15	NTU to recover equipment installed at Glen Affric.	NTU	To send a letter for change of ownership with recorded delivery.
06/07/2022	2.15	NTU to complete the pilot test storytelling of Glen Affric.	NTU	Stopped but NTU to write about storytelling with experience with GlenAffric.
06/07/2022	2.15	BED to complete the pilot test storytelling of HMF.	BED	Completed
06/07/2022	2.15	BED to complete the pilot test storytelling of YumChop.	BED	Completed
06/07/2022	2.15	UCD to complete the pilot test storytelling of Burns Meats Farm.	UCD	Ongoing
06/07/2022	2.15	UU to complete the pilot test storytelling for 3DF sensor.	UU	Ongoing
06/07/2022	2.16	Levstone to send any extra data parameter required for the app development as it may differ from modelling data requirements.	Levstone	Completed for Bluetooth and ongoing for Whysor virtual sensors.
06/07/2022	2.16	JE to arrange a meeting with GSJE and tech team to ensure consistent data labels.		Completed

06/07/2022	2.16	Levstone to develop REAMIT specific App.	Levstone	Completed for Bluetooth and ongoing for Whysor virtual sensors.
06/07/2022	2.16	Levstone to develop a second database for potential demand points.	Levstone	Ongoing
06/07/2022	2.16	SenX and data analytics partners (and Whysor) to integrate SenX system for data analytics with Whysor API approach.	SenX and Whysor	Real time part is yet to be completed.

All of the actions had been reviewed. Ram informed that no feedback was received from Advisory Committee members (Anne Marie had attended an earlier session and gave positive feedback).

*Plans for the next RAC meeting hosted by Essex, 22-23 March Colchester, UK*

On 22 and 23 March 2023, the final RAC meeting will take place in Colchester at the Wivenhoe house hotel. There were 15 rooms still available if partners were interested. Ram informed that the Essex/BED team would be sending the details on booking the hotel or others nearby.

END OF DAY 1

## **Day 2. Thursday 12 January 2023 – Morning Session**

### **09:00 – 10:30 WP Project Management (Chair BED)**

Kate (KP) reminded the reporting deadlines. The project progress report 4.1 for January – June 2022 has not yet been processed and will be processed in the first quarter of this year. KP mentioned that some partners submitted their reports as late as December 2022, so this caused a delay. Every partner needs to arrange one on the spot audit. On the spot audit of report 4.1 will take place at BED and Essex on 23<sup>rd</sup> February 2023. The money for the period January – June 2022 should be paid around April 2023.



Report 4.2 for July to December 2022, partners should be talking to their auditors to arrange their audits now. Partners should finish their reporting by March 2023. Final deadline for submitting partner reports to LP is Friday 3 March 2023.

REAMIT target groups: partners need to report in eMS the specific target groups they have contacted, for reporting purposes.

Report 5.1 will be the final project report. It will cover the period from 1 January 2023 to 9 July 2023.

RR suggested end of March as the latest date for partners to submit any financial claims, as they will be closing off the project. Make your FLC aware of any charges closer to the deadline, try not to make any claims after March 2023, RR stated. Staff costs will be covered until 9 July 2023. Only staff costs should be the exception after March until July.

Regarding Programme Manual, KP advised on all aspects of the final project appraisal. A preliminary questionnaire will be sent out to the LP (6 Months before end date) to collect information on outputs and results. These will be returned with the final project progress report. The final payment will take place once the secretariat has completed the final appraisal and final monitoring report, providing there are no issues.

Partners are required to keep records of all documents, electronic copies to be stored securely for up to 10 years.

DB recommended partners should store files encrypted and secure drive with whatever is included in SharePoint.

RR spoke about how we can carry on REAMIT's legacy and suggested that a UK organisation will not be able to lead but UCD or any other partners can choose to lead a similar project.

RR spoke about setting up an ESRC centre in Essex focusing on food waste reduction. RR is going through this process to develop a project proposal to set up this centre.

**Action: All partners: for each work package lead to ensure all information on SharePoint is up-to date and correctly ordered by the end of January 2023. Order the folders by WP and deliverable.**

**Action: All partners should be talking to their auditors to arrange their audits of report 4.2 and they should finish their reporting by March and submit it to LP.**

**10:30 – 10:50 Tea/Coffee Break**

**10:50 – 11:20 WP Long Term (Chair BED)**

Kate said: Yesterday, we hosted Anna-Marie from the East-Netherlands Enterprise Agency. Today, she sent us an email asking if we can present to partners ‘Step 1’ proposal that they have submitted to Interreg North Sea Region Programme. They are looking for partners/associate partners to help them develop a full proposal, so this is only an expression of interest. Interreg North Sea Region Programme covers regions in dark green – Whysor is the only partner present who is eligible for the funding. The project proposal falls under priority of green transformation circular economy. The project is called F2F value and will create more resilient agri-food supply chains by encouraging and supporting 40 SMEs in the value chain of vegetables, dairy and marine products to maximise the value of feed stock and thereby minimising food waste. They want to create a business model and support for technological solutions. Duration is October 2023 – September 2027. If interested, Kate can forward the presentation and contact details. They are a business development agency in the NL and they are looking for ideas from enterprises for the development of their WP T3 (business models and technological support). The Dutch agency will be leading the project.

Ram said that we have to create an agreed framework for sharing the impact of REAMIT technologies for reducing food waste. Ram believes this framework will be based on the LCA case studies – we need to link the estimated reduction in carbon emissions to the number of alerts sent, so we can state that our solution results in some amount of food waste reduction. Ram has requested the LCA team work to produce this new estimation based on the number of alerts sent.

We have already done four REAMIT networking events which were expected to be part of the project. NTU has already presented their policy briefing. Additionally, Ram has submitted a policy briefing document exclusively on what we are doing in the REAMIT project to the UK government. UK policy makers are currently reviewing it. If they are happy with it, they will then publish it on their website. If anyone wishes to take a look at what Ram has sent, he is happy to send it to the relevant partner.

Cross sector briefings: Ram is making a presentation at an international conference next month where he is going to highlight that tracking temperature in the cold chain can be useful outside the food sector, for example vaccine supply chains. This is an example of how REAMIT ideas can be used outside of food industry. Kate said that, in general, health, and paper (James explained that Andy Keery had used a cold store to preserve water damaged paper for an insurance company), flowers are the industries which could be

interested in the REAMIT solutions. Ram requests if there will any other ideas, we can include them in this document too.

Network prospectus. It is about what different networks that we have created beyond this group. We will derive this deliverable and its contents from our target audiences reached.

There is a separate point on presentation of updates including the 4<sup>th</sup> REAMIT symposium. Ram noted that we have not received a report on the symposium yet. Ram asked Gael if he can contact Memona for this report.

**Action: Valorial to share the report from 4<sup>th</sup> REAMIT Symposium.**

Kate asked: What do we do with sensors and equipment currently with pilot companies at the end of the project?

Ram explained that we back everything and keep it at University of Bedfordshire. We change the ownership of equipment to the pilot companies and let them do whatever they want – for example, the company can approach Whysor or other individual IoT companies to connect the equipment to the cloud and continue receiving alerts. As suggested by Marcel, the company may wish to coordinate with a reseller rather than companies directly. We could create a spinoff who will coordinate the activities of the existing pilot test companies and work with Whysor to continue their work. Again, this requires a company.

Ram has already contacted Joan about this. UU (led by Joan) already has a spinout created, ActionSense (an associate partner on the REAMIT project), which could be used as the middleman. Using ActionSense would reduce the logistical burden of setting up another university spinout. Joan and Ram are going to discuss this option further. Joan, Marcel, Kate, and Ram will organise a meeting about this.

**Action: Joan, Marcel, Kate, and Ram to organise a meeting about ActionSense being a link between pilot test companies and Whysor after REAMIT closure.**

James asked if there was an issue in companies retaining equipment for auditing purposes (i.e. option 2). Ram said that we will keep a record of where all equipment has been distributed to if this is the option chosen.

Davinder said that hardware is normally a write-off on these projects so should not cause an issue.

Ram asked Whysor to push data to the Bedfordshire cloud until 9 July 2023. After that, there is no obligation since we will not have Joy or Sahar to perform data synchronisation.

Kate asked how we could keep the data flowing after 9 July 2023. Ram said that after 9 July 2023, it has to be paid for by the pilot company.

Marcel has sent an example pricing strategy to Ram for what maintaining equipment and connection to the Whysor cloud would cost. If a middleman company is involved (e.g. ActionSense), they can charge more than Whysor to the company (e.g. double) so they can make a profit.

After the meeting with Joan and ActionSense, companies can be approached and told how much it will cost them going forward to maintain connection to the Whysor cloud and services. If they are not interested, the ownership of the equipment can be changed to a) the company and they can find their own supplier, or b) to the UoB and equipment returned to the UoB.

Example prices are €16 per month for WD Meats, or > €70 per month for BioGros.

#### **11:20 – 12:00 Research studies from the REAMIT project (Chair BED)**

Ram opened the session by gratefully acknowledging all the partners contributions to the REAMIT-led MDPI *Sustainability Journal* special issue *New Multidisciplinary Approaches for Reducing Food Waste in Agribusiness Supply Chains*. From an initial idea of two – three papers, a list in June 2022 was produced with 22 potential ideas for publication. Ultimately, 13 papers exclusively documenting research from the REAMIT project were submitted to the journal and one paper on the legal and accounting side of food waste which was partially funded by Essex and partially funded by the REAMIT project.

So far, including one acceptance received this morning, ten papers have been accepted and 8 of these are already published online. The remaining papers, except one, are under multiple stages of review at present. We have therefore already reached the minimum target of ten papers for preparing a book from the special issue, which is the plan from this work.

Ram thanked all colleagues who were contributing to the article processing charges of the journals. Out of the 15 articles, we received fee waivers for 8, 50% discount on 5, 30% discount on one, and one at full price.

Thanks to Joan and Fionnuala for already stepping in to cover some of these charges. UoN has already paid their APC.

Thanks to work carried out for this special issue, the name REAMIT will be etched into records permanently, and because it is an open issue anyone can see it. Ram is confident we will receive a large number of citations in the coming years.

However, our project activities are still ongoing which means research is still being done regularly, so please do not stop planning and writing articles. For example, there should be one paper on WD Meats and Burns Meats study, as well as new analytics which could become a publication – linking temperature with weight loss / dark facings. Ram is interested in Jean-Charles' new metric, which he has defined for anomaly detection. He believes if we can validate the new measure, it would be a very good contribution to the literature.

Additionally, variations in temperature using the reference demand model framework could be a very good work. As we need to complete at minimum 5 LCA's (currently we have four), additional LCA publication works may also be possible. As usual, Ram needs the groups cooperation to complete any additional journal articles although he is happy to contribute.

**Action: Partners to complete a paper on WD Meats and Burns Meats study, as well as new analytics.**

**Action: All partners to create an agreed framework for sharing the impact of REAMIT technologies for reducing food waste (based on the LCA case studies).**

**END OF DAY 2.**

**Actions resulting from RAC/WP/RSC meeting on 11-12 January 2023, Dublin**

Date	Minute/Item	Action identified	Responsibility	Status
11/01/2023		Whysor with support from university partners (UEssex) to develop a case study document on the pilot test with Picnic.	Whysor and UEssex	Ongoing by UEssex, make it anonymous one on last mile delivery.
11/01/2023		Whysor to install ten new sensors in Picnic in January 2023, to define trips for which we want extra data from Picnic for analysis, and to define cooling profile and look for anomaly detection.	Whysor	Ongoing, due to low response from Picnic.
11/01/2023		Whysor and BED to gather information on the prices of various components that were purchased. This could help to calculate the costs associated with the use of technologies (in addition to the environmental cost calculation).	Whysor and BED	Ongoing with BED
11/01/2023		Kate to share with partners a research publication on costs-benefits analysis of using IoT technologies by companies.	BED (KP)	Completed.  Preliminary draft of the duality paper

				is being been prepared.
11/01/2023		Whysor, the REAMIT analytics team and writers of the case study will meet with BioGros to further discuss other relevant issues that need to be explored and gather some additional information.	Whysor	Met in January, waiting for response from Biogros. There could be language issues here.
11/01/2023		Whysor and the REAMIT analytics team will continue to work on defining the anomalies.	Whysor	Meeting with Biogros completed.
11/01/2023		UoN will test the portable Raman sensor-based system in journey in February 2023.	UoN	Completed. Two tests have been done and documented.
11/01/2023		UoN will further explore the possibility to collaborate with Vivo Group and will discuss installing Raman sensor-based technology on their premises to test quality of sea food before/during transportation to other customers.	UoN	Discussions with Viva group ongoing. Will be presented in Day 2.

11/01/2023		UoN to develop the Storytelling (Deliverable 3.3) and user manual (Deliverable 3.2).	UoN	Completed
11/01/2023		BED to prepare a story telling document on YumChop.	BED	Ongoing
11/01/2023		Whysor and the HMF team to resolve the issue of connectivity between sensors and the cloud as well as the communication breakdown, and alarming.	Whysor	Ongoing
11/01/2023		BED to purchase new sensors for HMF.	BED	Stopped
11/01/2023		Whysor to improve the dashboard by adding new features such as configuration for binary sensors.	Whysor	Imke to check with Marco/Tom.
11/01/2023		Once WD Meats provide start and end weights for trials that took place in April and August 2022, James will try to perform one more iteration with different structuring of carcass's/sensors or different temperature and humidity parameters for the refrigeration unit.	UU (James)	Some data received and more data being collected.



11/01/2023		UU to help WD Meats with calibration/benchmarking.	UU	Ongoing.
11/01/2023		UU to complete a technical report on Clostridium results.	UU	Ongoing.
11/01/2023		UU to prepare new controls for WD Meats and ensure that their lab can replicate the same results as UU lab.	UU	Ongoing.
11/01/2023		UU to move the sensor to 'air on' of the refrigeration unit inside the Musgrave van and to see if more accurate ambient temperature data is available.	UU	Completed.
11/01/2023		UU (James) to document a key objective of the pilot test with Andy Keery Refrigeration and to discuss the potential advantages of the technological deployment to his company.	UU (James)	Completed.

11/01/2023		UCD to visit BMF to install binary sensors (door open/closed) in order to improve the alerting system.	UCD	Partially completed.
11/01/2023		UCD to improve the alerting system in Burns Farm Meats pilot test.	UCD	Ongoing
11/01/2023		UCD to visit BFM and deploy a new Eagle logger with humidity probes and binary sensors.	UCD	Ongoing
11/01/2023		UCD and data analytics team to ask BFM for weight data from at least one cycle of dry aging process as this would allow to propose restructuring of beef carcasses if differences are observed, and to compare results from WD Meads and BFM.	UCD	Ongoing
11/01/2023		Data analytics, Levstone and Whysor to develop a system to alert HMF of any temperature fluctuations inside human milk bags.	Levstone and Whysor	More developments are needed for the App.

11/01/2023		With regard to Musgrave, UU to arrange a longer recording every 5 minutes just in the freezer unit in future.	UU	Stopped.
11/01/2023		NTU to lead on approaching pilot test companies and asking them whether they had a significant reduction in food waste after installation of the REAMIT approach (e.g. drafting a template email to have a written response from pilot test companies).	NTU	To be taken from testimonials/video transcripts.
11/01/2023		NTU to facilitate a discussion among the REAMIT consortium about how REAMIT could create more awareness of the benefits that combining IoT sensor and Big Data technologies could have for agri food companies. As an outcome, NTU to produce a brief document with input to the final REAMIT project report.	NTU	See the policy support document and the CS document.

11/01/2023		NTU to develop a document listing the benefits for agribusiness users from using the REAMIT's approach and technologies, based on input from pilot test companies. Infographics can be used as starting point. This will serve as input to the final REAMIT project report (closure report).	NTU	Available in the CS document.
11/01/2023		Tahmina to contact Central Bedfordshire Council regarding policy areas where REAMIT could contribute to.	BED (Tahmina)	Stopped
11/01/2023		Kate to share the link to the European Commission website on food waste reduction policy.	BED (Kate)	Completed
11/01/2023		NTU to organise a meeting on how REAMIT can influence policy making. Invitees Usha, Joan, Kate, etc.	NTU	Completed
11/01/2023		NTU to work with Kate on types of stakeholders approached by REAMIT.	NTU	Completed, part of the infographic.

11/01/2023		Partners to keep communicating about REAMIT through social media channels to help increase the visibility of the project.	PPs	Ongoing
11/01/2023		Partners to develop more case studies and publications inspired by REAMIT.	PPs	Discussed today at the Research session
11/01/2023		NTU to send links to REAMIT videos to partners.	NTU	Completed
11/01/2023		Partners to follow NTU's example and develop press releases about REAMIT.	PPs	Completed
11/01/2023		NTU to develop 'meet the team' section on the REAMIT website.	NTU	Completed
11/01/2023		All partners to access and suggest any improvements of the policy briefs document.	PPs	Ongoing

12/01/2023		All partners: for each work package lead to ensure all information on SharePoint is up-to date and correctly ordered by the end of January 2023. Order the folders by WP and deliverable.	PPs	Completed
12/01/2023		All partners should be talking to their auditors to arrange their audits of report 4.2 and they should finish their reporting by March and submit it to LP.	PPs	Completed
12/01/2023		Valorial to share the report from 4 <sup>th</sup> REAMIT Symposium.	Valorial	Completed
12/01/2023		Joan, Marcel, Kate, and Ram to organise a meeting about ActionSense being a link between pilot test companies and Whysor after REAMIT closure.	Joan, Marcel, Kate, and Ram	Completed
12/01/2023		Partners to complete a paper on WD Meats and Burns Meats study, as well as new analytics.	PPs	Ongoing

12/01/2023		NTU to collect testimonials from pilot test companies on how REAMIT helps them reduce food waste, given information on actual volume of food waste is often considered sensitive and companies are not keen to share it.	NTU	Completed
12/01/2023		All partners to create an agreed framework for sharing the impact of REAMIT technologies for reducing food waste (based on the LCA case studies).	PPs	Ongoing







# APPROVED MINUTES FROM THE 9<sup>TH</sup> MEETING OF REAMIT ADVISORY COMMITTEE, WORK PACKAGES AND STEERING COMMITTEE MEETING, 22 – 23 MARCH 2023 HOSTED BY UNIVERSITY OF ESSEX, COLCHESTER, UK

Attendees:

<b>Name</b>	<b>Institution</b>	<b>Name</b>	<b>Institution</b>
Ram Ramanathan (RR)	Essex	Jean-Charles Vialatte (JV)	SenX
Katarzyna Pelc (KP)	BED	Fionnuala Murphy (FM) online	UCD
Sahar Ahmadzadeh (SA)	BED	Shane Ward (SW)	UCD
Tahmina Ajmal (TA) online	BED	Tamiris Da Costa (TC)	UCD
Gael Maugis (GM) online	I&R	Xavier Cama (XC)	UCD

Davinder Bola (DB)	Levstone	Omar Dib (OD)	UoN
Gautam Samriya (GS)	MTU	Imke Hermens (IH)	Whysor
Usha Ramanathan (UR)	NTU	Ali Assaf (AA)	UoN
Sasha Bennett (SB)	NTU		
James Gillespie (JG)	UU		
Joan Condell (JC) online	UU		
Trevor Cadden (TC) online	UU		

**Day 1. Wednesday, 22 March 2023**

**11:00 – 11:30 RAC**

Kate presented an overview of the progress of the project. Her presentation is saved in the SharePoint. Kate provided an update on each of the six REAMIT work packages.

WP T1 – adapting and pilot testing sensing technologies in agri-food supply chains:

- Deliverables DT1.1.1, 1.1.2, 1.2.1 have been completed.
- DT1.2.2 (Test roadmap), DT 1.3.1 (Working prototypes using sensor technology), DT1.3.2 (User manual for each pilot) and DT1.3.3 (Report on the pilot test and development of the sensor prototypes) are each still ongoing.
- REAMIT continues to work with nine companies (and ten working prototypes) and there has been progress with most of them.
- At UoN, the Raman spectroscopy stage 3 has been completed and deliverables for WP T1 have been finalised. Stage 3 involved renting a truck and installing the Raman system while conducting field testing in Nantes. Observations included vibrations coming from bumps affected the signal, and that the sample holder shape needed updated according to the various product. UoN have also produced a video documenting the trial. UoN are working with SenX on analytics for this trial.
- At WD Meats (UU), a new lab scientist at UU has been helping with the Clostridium identification. UU hope to perform two more iterations of the dry age trial before the end of the project to allow for comparative study between WD Meats and Burns Farm Meats data.

- At Yumchop, on 24 March 2023, there is a planned installation of a sensor in a vending machine at Victoria Coach Station in London. Abi asked REAMIT if they could install sensors in a delivery truck being used to deliver Yumchop food to Sainsbury's and for a second vending machine. However, REAMIT will not be able to provide any more sensors to Yumchop because of the closure of the project. Abi is approaching universities to see if she can install kiosks in these campuses. Ram noted that Yumchop has recently installed a freezer at the UEssex campus at students' union. Usha is going to try to get NTU to agree to Yumchop's freezer installation too.
- At HMF, Trevor from UU has carried out a qualitative interview with HMF. Natalie would like to see smaller and lighter sensors installed in human milk bags, however, like Yumchop, the project will not be installing new sensors. Natalie would like to see the mobile APP which has been created by Levstone and is available on SharePoint. Kate has started a research study on duality of technology and impacts on companies, which will involve HMF.
- At Musgrave, the sensor location has been changed in two of the vans and batteries have been replaced. Ambient temperature values have improved since, however there are still ongoing issues. Tamiris plans to do an LCA with Musgrave as the 5<sup>th</sup> study required for REAMIT.
- At Burns Farm Meats, a binary sensor has been installed on the doors to improve alerting criteria. Trim loss weights have been provided. An Eagle logger was installed to help validate humidity data but did not connect to the network for communication. JG has proposed building a small sensor setup to validate the humidity values for Burns.
- For the 3DF trial at UU, JG has performed experimentation (with his colleague at UU) on the detection of quality deterioration of milk. The work is ongoing.
- An email has been sent to pilot test leads and forwarded to most pilot test companies enquiring about preference for sensor ownership after the project ends. Three options were presented:
  - o the sensor could be returned to the pilot lead (partner of the REAMIT project)
  - o the sensor could be kept by the company and they find their own cloud system to avail of the sensor functionality
  - o the sensor could be kept by a pilot test company and a sub-partner on REAMIT (Action Sense) could handle the interaction between the pilot company and Whysor so the company can continue to use the sensors and dashboard in their current format (approx. €10 per sensor per month)
- REAMIT partners received feedback from 2 pilot test companies: Burns Farm Meats would like to maintain ownership without the subscription, while Yumchop would like to continue with the subscription service. We have not received any further subscription request so far.

**Action: Usha (NTU) to try to get NTU to agree to Yumchop's freezer installation at NTU campus.**

WP T2 Big data integration and applications to reduce food wastage include the following:

- Development of the smartphone app has been finalised by Levstone and uploaded to the SharePoint. It is now ready to be tested by partners. Blue Maestro development has stopped.
- As for analytics, there are six working groups on data analytics lead by different partners (Picnic and BioGros by SenX, Yumchop by MTU, Musgrave by UU and MTU, WD and Burns by UU and MTU, Raman by SenX and UoN). Further updates will be provided on the progress of these groups later in the meeting.

WP T3 Business development of REAMIT technologies:

- Updates on this work package will be provided later in the meeting.

WP Communication:

- NTU has been leading on communicating about the documentary, producing the newsletters in February and April.
- Usha noted that there will be one further newsletter produced in June.
- For research, there are five planned papers, they will be discussed in further details later during the meeting. Ram noted that this includes also the quantitative study led by Yan and the qualitative study led by Trevor.

WP Management:

- The project handbook is being constantly updated – the latest version is on SharePoint. It is currently over 1000 pages long.
- The minutes from the previous REAMIT meeting in January 2023 have been completed and shared with partners. They will be discussed later.
- Over 20 online meetings of different groups took place in the past 3 months.
- New risks will be discussed during the RSC meeting.
- BED is still in the process of the on-the-spot audit.
- Partners will need to prepare for the audit of report 4.2 and the final audit of report 5.2.
- REAMIT officer at the joint secretariat has sent closure paperwork to BED/UESsex. There is a planned meeting on 16 May 2023 in person in Luton, UK – a final appraisal meeting with the REAMIT officer at founder's organisation.
- MTU, UoN, and UCD still need to complete their on-the-spot audit.

WP Long Term:

- No updates to be presented now.

### **11:30 – 12:30 Research Studies**

Ram thanked all partners who submitted papers to the special issue of *Sustainability Journal*. 15 research papers were submitted, and 12 were accepted and published. Almost all had one round of review, three or four had two rounds, one had three rounds, and the one that is still under consideration has gone to the 5<sup>th</sup> round of review. One paper has been declined. Ram hopes that the one at the 5<sup>th</sup> round is published soon as the last revision was very minor. Ram intends to produce a book from the journal after the 5<sup>th</sup> review round paper has been accepted. The book will be printed for five editors and will be available online for others.

RR notes that what was published was the situation 6-8 months ago and the project has progressed since. Hence, Ram would like to see more papers published documenting the additional work carried out by the partners. Each partner presented their publishing plans.

### **Ulster University**

Ulster is currently focused on producing a paper on the qualitative study entitled “The Role of IoT Sensors in Achieving Increased Sustainability Practices & Performance – The Moderating Role of a Data-driven Culture” being led by TC with support from his PhD student, Emmet. The target for paper completion /submission is the end of July to a good 3 rated journal on operations and technology.

Currently, UU is at the data collection stage. The goal for the work is to include six interviews focused on REAMIT pilot companies. At least one other interview has been completed with an agri-food company that is external to REAMIT. So far, four interviews have been completed with REAMIT companies: Musgrave, Burns Farm, HMF, and BioGros. There are plans to interview Yumchop and WD Meats in April. There was no response from Picnic.

Emmet has proposed working with Lakshmi (UESsex) on the literature review for the paper, and they have already exchanged emails related to this work. NVivo, a qualitative data analysis software, which allows thematic analysis, will be used for data analysis.

Ulster are planning a comparative study between WD Meats and Burns Farm Meats. Unfortunately, the data collection phase for this study is still underway so there is not a clear timeline on when this paper could be completed by. It will take until the end of May at least until the necessary weight data is collected. Xavier collected trim loss data on site at Burns Farm in February, which ideally, we would add to as the current dataset is rather small.

UU had one paper submitted to *Sustainability Journal* reviewing sensing technologies for minimizing beef waste – it received one round of revisions before going to the editor who decided it wasn’t enough. They, however, encouraged re-submission after a month. Ram confirmed that if submitted, it would still be eligible for the special issue. JG mentioned a new researcher who has joined UU – Leigh Johnston – who intends to look at this paper and see if additional literature on quantitative reporting can be added to the article for re-submission.

Ram reminded partners that REAMIT should be acknowledged including its reference number as source of funding for any future journals which are published. A request was also made to ensure the communication team is aware of any additional publications produced.

### **University College Dublin**

The goal is to produce a comparative study between the two abattoirs (Burns and WD Meats) as JG already mentioned. Currently, we do not have enough data collected. Some data was collected on 22 February 2023, and the plan is to revisit it in the next few weeks so that more data can be recorded. A draft of the paper has been started. However, since the weight data is lacking, currently the paper is focused on LCA, provided by Tamiris. The idea is that we can incorporate the weights from WD Meats to a bigger paper. Expected timeline: it will be completed by July 2023. Ram suggests that data collection should be completed by the end of the project, but writing could happen after that if required. Tamiris is working on a dynamic LCA paper which has already been drafted and needs some minor revisions. She hopes to complete the work in the next 1-2 months.

### **University of Nantes**

AA has contacted University services and there may be a patent on the results of the Raman spectroscopy, with the goal of a Raman platform used for quality monitoring during transportation. AA will have a meeting with the university next week. RR congratulated AA and noted this is a great result and would be the first patent from the project.

OB has been working with UU testing the fresh detect. JG has started testing with milk, and the plan is to expand this testing to other products, for example olive oil as it is known to produce more peaks. Afterwards, the plan is to build a model to predict the quality of food and present it as an article in the next four months.

Ram believes that this will be a good work because we have already demonstrated that we made some progress with fluorescence spectroscopy. Ram requested that UU takes responsibility to ensure the FreshDetect is returned to Matthias at the end of the project.

### **SenX**

JC presented his analytics on BioGros using an anomaly score which could be published in the article. The anomaly score indicates if the transportation was carried out with good temperature control so that the quality of the transportation can be assessed. Ranges of temperature are used and for each range a penalty weight exists. These are combined to output a score and from this score we can say if good conditions were met or not. If the anomaly score was high, the transportation was not good. The anomaly scores can also be forecast in the future. While the analysis has been performed with regard to BioGros, it could be applied to any pilot test with temperature sensors.

Plan for a research paper includes: Novel anomaly score for assessing food transportation; comparative analysis of this score with classical anomaly detection; application as a standalone metric on a single sensor; application of the aggregate of each score on a full transportation route; strategies for incremental update of penalty weights; and relation with basic artificial neuron model.

Ram asked JC if he was working with any of the academic institutions on this article. JC replied he was not. RR stated that it was very important that an academic collaboration was sought. Tahmina volunteered to help JC. Ram also said he would help. Ram said if JC provides the data and results, they can write a paper. Usha has also recruited a new member of staff who will join next month and has expertise in various algorithms. This new staff member may also be available to help write the paper.

Kate asked JC if he would be available to continue work on this publication after the project finishes. JC however said he thinks he should be able to do most of the work in April.

### **MTU**

Statistical process control paper (SPC) was submitted to the special issue based on Picnic dataset. However, the reviewers asked some questions which required more data to answer. The comments also asked data to be collected over the summer period, however the dataset did not have any of this. One reviewer also noted that the work was not novel which GS disagreed with. Based on the comments and available data, the plan is to tweak the scope and purpose of the paper and re-submit it again. GS hopes to re-submit it in the remaining time he has at MTU. Ram notes that he is confident the paper is still publishable, and that the differences between the April and August dataset compared in the paper should be drawn upon. Ram believes the deadlines for this special issue have been missed but it could go to other journals. Tahmina

suggested she could support Gautam, and he is happy to collaborate with Tahmina and Jean-Charles on a joint, mixed paper with SPC paper and anomaly detection.

Ram proposed that some of the story telling documents prepared for WP T1 could be turned into publishable case studies. Ram asked if any efforts are being made for this. Usha said she has started preparing a case study for BioGros. This will be published in the case centre, not in a journal.

**Action: NTU to led work on turning some of the story telling documents prepared for WP T1 into publishable case studies.**

## **BED**

YD is working with RR and Lakshmi on the quantitative paper. The aim is to target a 3 rated journal based on the model testing result. Yan thinks sector specific journals like food policy with descriptive analysis as ICT adoption journals are sometimes difficult. Yan aims for a draft before May.

KP is working on a paper entitled “Dual effects of the internet of things (IoT): Benefits and risks of IoT adoption in agri-food supply chains – learnings from two case studies in the UK.” Seen as an extension to the agri-food sector based on the REAMIT work conducted here on a paper on the dual effects already in the literature. The learnings would be from 2-3 case studies: HMF, Yumchop, and Musgrave as KP has been involved in the qualitative interviews with these companies. What are the benefits, risks, organizational conditions, and consequences of IoT adoption. Data collection will be through participant observation. One challenge Kate sees with the paper is that it the data collected may not be detailed enough and may require other technology adoption data like linking the mobile APP to the alerts to be implemented. Ram encouraged Kate to continue pursuing this idea and there is a lot of data from the project that could be used to inform the research work.

## **13:30 – 14:30 Work Package Long Term and RSC Meeting**

Three points were discussed in WP LT: policy briefings, cross sector briefings and network prospectus.

### **1. Policy briefings**

Usha stated: We started this documentation six to eight months ago. It was discussed in detail in our RSC meeting in January 2023 and some of you have commented on how to proceed with a policy brief. In the meantime, Ram’s Office at the University of Essex has developed two different policy documents. Ram has prepared a policy document (REAMIT-related) which was further submitted to the UK Parliament in response to their call for evidence. It was shared with everyone.

Based on REAMIT, the policy is renamed as Policy Support document rather than policy document because we are not creating any policy based on REAMIT. We are trying to support the policy developments in the UK and European countries. The document is tweaked in terms of different stakeholders’ viewpoint, what policy they consider based on the examples from REAMIT. So that was already developed, and I uploaded it to SharePoint. The document was shared with everyone.



The second policy document was prepared by Usha. This document is based on the question: *what policy can be incorporated within the REAMIT stakeholders*. That means we cannot take all IoT sensors in all good supply chain. Only certain things can be possible for example: how it can be incorporated locally to make food waste reduction as well as carbon emission reduction. Those things are classified under different headings.

The third policy document was prepared by Ram.

Ram noted: The first document that I submitted to the UK Parliament in response to their call about for evidence like the climate change, sustainability, etc. I submitted a document saying that while we do a lot of wonderful things in the UK about the climate change and sustainability, the focus on food waste could be somewhat cheap way of addressing much of a big problem, because saving food from becoming waste is a much cheaper way of saving carbon emissions compared to more capital-intensive ways of reducing carbon. My university suggested that I submit another such policy briefing, Labor Policy Forum. Every Labor Party member is looking for what to focus the next few years. They are looking for relevant policy choices that they must start working on and they have called for, not necessarily from Labor Party members, but also from wider public. In both documents, the first and the second, I stressed the two important points. The first point is basically saying that saving carbon emissions by saving food from becoming waste will be much cheaper compared to any other ways of reducing carbon emissions. The second point is that all companies should be rethinking about food waste reduction in their system.

Ram suggested that companies should be forced to measure their food waste to help them reduce it. Ram also suggested using IoT technology to monitor and reduce food waste. Additionally, Ram suggested that incentives could be used to encourage companies to reduce food waste but measuring it should be the starting point.

Feedback on Ram's policy briefings:

Shane Ward from UCD, discussed the issue of food waste in the food industry, stating that companies internalize their losses and use tactics like marketing ploys to sell produce that they know they won't be able to sell, resulting in waste at the consumer level. He also mentioned the issue of supply contracts with farmers and how farmers may have to discard produce that doesn't meet strict criteria, even if it is edible and nutritious. He added that looking at the system, as a whole, it is necessary to address the problem of food waste, estimating that 30-50% of food produced is wasted globally. He criticized the use of food banks as a solution to food waste, stating that it's not a sustainable solution.

## 2. Cross sector briefings

Ram asked partners to collect all the deliverables that were created in a single place in SharePoint.

Sahar presented progress of deliverables in WP Long Term.

Deliverable 1.1. Network prospectus

Deliverable 1.2. REAMIT networking events 2019, 2020, 2021 and 2022– completed and a report from each event has been uploaded in SharePoint.



Deliverable 2.1. The agreed framework for measuring the impact of REAMIT technologies on food waste. A paper that is published by Ram Ramanathan about the motivations and challenges for companies and using IoT sensors for reducing food waste, which also includes insights and a road map for the future research – completed.

Deliverable 3.1. Policy briefings– completed and uploaded to SharePoint.

Deliverable 4.1. Cross-sector briefings – ongoing (cross sector briefings PPT need to be saved in SharePoint. All four papers need to be inserted in a new sub-folder (deliverable 4.1) in SharePoint.

### **REAMIT Steering Committee meeting**

The minutes of 8<sup>th</sup> RSC meeting (11-12 January 2023) will be confirmed, and partners will be asked to report their activities as per the minutes. For the list of actions please refer to the draft minutes.

Draft Minutes from RAC WP RSC meeting Dublin (11-12 January 2023) document was sent one week ahead of this RSC meeting in Colchester (22-23 March 2023).

#### **1. Risks in REAMIT:**

- NTU partners have experienced challenges with obtaining back REAMIT IoT equipment from Glen Affric, who decided to disengage from the REAMIT pilot test. UR confirmed that eventually Glen Affric returned to NTU all the IoT equipment.
- IH from Whysor confirmed that long waiting time for reimbursement of funds is a risk for small companies such as Whysor.

#### **2. Action Log: Actions resulting from RAC/WP/RSC meeting on 11-12 January 2023, Dublin, Ireland.**

Date	Minute/Item	Action identified	Responsibility	Status
11/01/2023		Whysor with support from university partners (UESsex) to develop a case study document on the pilot test with Picnic.	Whysor and UEssex	Ongoing by UEssex, make it anonymous one on last mile delivery.
11/01/2023		Whysor to install ten new sensors in Picnic in January 2023, to define trips for which we want extra data from Picnic for analysis, and to define cooling profile and look for anomaly detection.	Whysor	Ongoing, due to low response from Picnic.

11/01/2023		Whysor and BED to gather information on the prices of various IoT sensors components that were purchased. This could help to calculate the costs associated with the use of technologies (in addition to the environmental cost calculation).	Whysor and BED	Ongoing with BED
11/01/2023		Kate to share with partners a research publication on costs-benefits analysis of using IoT technologies by companies.	BED (KP)	Completed.  Preliminary draft of the duality paper is being been prepared.
11/01/2023		Whysor, the REAMIT analytics team and writers of the case study will meet with BioGros to further discuss other relevant issues that need to be explored and gather some additional information.	Whysor	Met in January, waiting for response from Biogros. There could be language issues here.
11/01/2023		Whysor and the REAMIT analytics team will continue to work on defining the anomalies.	Whysor	Meeting with Biogros completed.
11/01/2023		UoN will test the portable Raman sensor-based system in journey in February 2023.	UoN	Completed.  Two tests have been done and documented.
11/01/2023		UoN will further explore the possibility to collaborate with Viva Group and will discuss installing Raman sensor-based technology on their premises to test quality of sea food before/during transportation to other customers.	UoN	Discussions with Viva group ongoing. Will be presented in Day 2.
11/01/2023		UoN to develop the Storytelling (Deliverable 3.3) and user manual (Deliverable 3.2).	UoN	Completed
11/01/2023		BED to prepare a story telling document on YumChop.	BED	Ongoing
11/01/2023		Whysor and the HMF team to resolve the issue of connectivity between sensors and the cloud as well as the communication breakdown, and alarming.	Whysor	Ongoing

11/01/2023		BED to purchase new sensors for HMF.	BED	Stopped
11/01/2023		Whysor to improve the dashboard by adding new features such as configuration for binary sensors.	Whysor	Imke to check with Marco/Tom.
11/01/2023		Once WD Meats provide start and end weights for trials that took place in April and August 2022, James will try to perform one more iteration with different structuring of carcass's/sensors or different temperature and humidity parameters for the refrigeration unit.	UU (James)	Some data received and more data being collected.
11/01/2023		UU to help WD Meats with calibration/benchmarking.	UU	Ongoing.
11/01/2023		UU to complete a technical report on Clostridium results.	UU	Ongoing.
11/01/2023		UU to prepare new controls for WD Meats and ensure that their lab can replicate the same results as UU lab.	UU	Ongoing.
11/01/2023		UU to move the sensor to 'air on' of the refrigeration unit inside the Musgrave van and to see if more accurate ambient temperature data is available.	UU	Completed.
11/01/2023		UU (James) to document a key objective of the pilot test with Andy Keery Refrigeration and to discuss the potential advantages of the technological deployment to his company.	UU (James)	Completed.
11/01/2023		UCD to visit BFM to install binary sensors (door open/closed) in order to improve the alerting system.	UCD	Partially completed.
11/01/2023		UCD to improve the alerting system in Burns Farm Meats pilot test.	UCD	Ongoing.

11/01/2023		UCD to visit BFM and deploy a new Eagle logger with humidity probes and binary sensors.	UCD	Ongoing
11/01/2023		UCD and data analytics team to ask BFM for weight data from at least one cycle of dry aging process as this would allow to propose restructuring of beef carcasses if differences are observed, and to compare results from WD Meats and BFM.	UCD	Ongoing
11/01/2023		Data analytics partners, Levstone and Whysor to develop a system to alert HMF of any temperature fluctuations inside human milk bags.	Levstone and Whysor	More developments are needed for the App.
11/01/2023		With regard to Musgrave, UU to arrange a longer recording every 5 minutes just in the freezer unit in future.	UU	Stopped.
11/01/2023		NTU to lead on approaching pilot test companies and asking them whether they had a significant reduction in food waste after installation of the REAMIT approach (e.g. drafting a template email to have a written response from pilot test companies).	NTU	To be taken from testimonials/video transcripts.
11/01/2023		NTU to facilitate a discussion among the REAMIT consortium about how REAMIT could create more awareness of the benefits that combining IoT sensor and Big Data technologies could have for agri food companies. As an outcome, NTU to produce a brief document with input to the final REAMIT project report.	NTU	See the policy support document and the CS document.
11/01/2023		NTU to develop a document listing the benefits for agribusiness users from using the REAMIT's approach and technologies, based on input from pilot test companies. Infographics can be used as starting point. This will serve as input to the final REAMIT project report (closure report).	NTU	Available in the CS document.
11/01/2023		Tahmina to contact Central Bedfordshire Council regarding policy areas where REAMIT could contribute to.	BED (Tahmina)	Stopped

11/01/2023		Kate to share the link to the European Commission website on food waste reduction policy.	BED	Completed
11/01/2023		NTU to organise a meeting on how REAMIT can influence policy making. Invitees Usha, Joan, Kate, etc.	NTU	Completed
11/01/2023		NTU to work with Kate on types of stakeholders approached by REAMIT.	NTU	Completed, part of the infographic.
11/01/2023		Partners to keep communicating about REAMIT through social media channels to help increase the visibility of the project.	PPs	Ongoing
11/01/2023		Partners to develop more case studies and publications inspired by REAMIT.	PPs	Discussed today at the Research session
11/01/2023		NTU to send links to REAMIT videos to partners.	NTU	Completed
11/01/2023		Partners to follow NTU's example and develop press releases about REAMIT.	PPs	Completed
11/01/2023		NTU to develop 'meet the team' section on the REAMIT website.	NTU	Completed
11/01/2023		All partners to access and suggest any improvements of the policy briefs document.	PPs	Ongoing
12/01/2023		All partners: for each work package lead to ensure all information on SharePoint is up-to date and correctly ordered by the end of January 2023. Order the folders by WP and deliverable.	PPs	Completed
12/01/2023		All partners should be talking to their auditors to arrange their audits of report 4.2 and they should finish their reporting by March and submit it to LP.	PPs	Completed
12/01/2023		Valorial to share the report from 4 <sup>th</sup> REAMIT Symposium.	Valorial	Completed
12/01/2023		Joan, Marcel, Kate, and Ram to organise a meeting about ActionSense being a link between pilot test companies and Whysor after REAMIT closure.	Joan, Marcel, Kate, and Ram	Completed
12/01/2023		Partners to complete a paper on WD Meats and Burns Meats study, as well as new analytics.	PPs	Ongoing

12/01/2023		NTU to collect testimonials from pilot test companies on how REAMIT helps them reduce food waste, given information on actual volume of food waste is often considered sensitive and companies are not keen to share it.	NTU	Completed
12/01/2023		All partners to create an agreed framework for sharing the impact of REAMIT technologies for reducing food waste (based on the LCA case studies).	PPs	Ongoing

- Feedback from RAC meeting and the decisions of the WP meetings will be discussed and approved after discussion.

Ram said that we did not have any Advisory Committee member talking about it. We have sent reports to them, and if we get any reply, we will work on their comments and suggestions.

#### 4. Reporting

Kate presented the calendar for the remainder of REAMIT project activity and finance report and payment claim. BED is still processing a report 4.1 for the six-month period of January – June 2022. There has been a big delay in processing the report 4.1 due to some partners submitting their reports late. The report 4.1 is subject to an on-the-spot check at University of Bedfordshire, which has been ongoing since 23 February 2023. The auditor has been asking for different documents and clarifications since the start of the project, but they are close to finishing the audit soon. The report will be submitted to the funder, and it usually takes about two weeks for the funder to send the money. The team expects to receive the funds by the end of April, after the Easter holiday.

All partners need to complete the report 4.2 in eMS by 30 April. BED, UCD, Levstone, MTU, SenX and Ulster need to complete audit of partners progress report 4.2.

NTU, UCD and UoN need to complete on-the-spot audits.

#### Closure timeline

- The team suggests that finance reports be completed by the end of May, giving partners one more month to complete their audits. Regarding closing reports, the team discusses the possibility of anticipating some documents, such as pay slips, to help speed up the process.
- The project will close on 9 July 2023, and the team hopes to have everything completed before then. Activity reports in eMS need to be completed and shared with all partners by 30<sup>th</sup> April 2023. The deadline for financial reports is end of May to allow for the completion of the audit at BED. Kate needs

to close the project on 9 July as her contract will end on the latter date. Partners expressed concerns about getting pay slips in time for the financial report.

- Joan and Usha should be invited to the meeting on 24<sup>th</sup> of May to discuss important points and issues regarding project closing strategy. Joan and Gael talked about a solution regarding project closure and financial issues that may be faced but it was not recorded.
- On-spot audit – some partners did not start it yet, which may lead to a delay in the final report submission and final payment.

## 5. REAMIT 2.0 and legacy

Ram mentioned that there are opportunities for the project extension, but it will be tough for UK to take lead or be a part of a big European consortium. The reason being that a UK partner in a consortium could bring more risk to the project as political situations could change and lead to instability. Ram proposed some opportunities using the Horizon Europe programme and there are some coordinated calls that the university wants to engage in. He is keen to bring the REAMIT ideas to the next level and believes that there is a good case to be made in reducing food waste using modern digital technology.

Tamiris and Omar presented an idea for an extension of REAMIT that will be submitted at end of June. It's a small project to reduce food loss and waste in the meat or seafood supply chain, with a duration of 18 months and a budget of up to 200,000 at 800,000 EUR. The project involves using Raman spectroscopy and IoT technology to reduce food waste during transportation and manufacturing, as well as including the consumer stage. The project aims to select one product to focus on, and deliverables include the Raman spectroscopy model, implementation of IoT technology during transportation, real-time data for consumers, and a life cycle assessment. The project is still in the planning phase and potential partners are welcome to join. Project partners are: UCD (lead) and UoN, and they are searching for a third partner.

Tamiris also mentioned a new project which is to expand human milk supply chain across Ireland (just an initial discussion). Kate suggested to bring new partners to the small-scale project. Ram suggested going for CFI for funding to extend REAMIT as REAMIT has top-level university involvement and several industries and has the potential to create a strong consortium.

**Action: All partners need to complete the progress report 5.2 on the eMS end of April 2023.**

**Action: All partners need to complete finance report 5.2 on eMS by end of May 2023.**

## 15:30-17:00 WP T3 Business development of REAMIT technologies (Chair UU)

Meeting agenda includes: an assessment report of REAMIT technologies including a comprehensive systematic review (mapping) of the technical and business landscape in the fresh produce food chain (September 2022); Life Cycle Assessment (LCA) for REAMIT (July 2023); current and identified future REAMIT technology assessment report (September 2022); Market readiness report (July 2023); and Business prospectus (July 2023).

Presentation of updates and results (10 minutes each) took place. It covered the following topics:

- Current and future REAMIT Technology assessment report
- Market readiness report
- Business prospectus
- LCA meat industry – WD Meats and Burns Meats (UCD)
- Quantitative study (BED)
- Qualitative study (UU)

**Speaker: James Gillespie (UU), T3 chair**

In the previous months, UU had been talking about how the business report of REAMIT technologies was going to be completed at the end of the project as it depended on pilot and data analytic results. James provided a summary on each activity and deliverable.

Activity 1, James discussed D1.1 and D1.2.

D1.1 – assessment report of REAMIT technologies including the comprehensive systematic review of the technical and business landscape in fresh produce supply chains, which was due for September 2022, had been completed and was available on SharePoint.

D1.2 – life cycle assessment system, which will allow environmental impact data to be integrated with REAMIT IoT sensors and big data solutions.

**Speaker: Tamiris Da Costa (UCD)**

Tamiris presented on D1.2 – LCA and explained that she had been updating and refining the results of the LCA studies, as follows:

For Yumchop, Tamiris showed the (old) LCA inventory and impacts that had already been previously presented, followed by the updated results – that is, how much the REAMIT technologies (IoT sensors) contributed to the environmental impact of the company. Updated results were now based on alerts. Previously, it had been done by taking assumptions into account (a 2% of food waste). James had written a code to estimate the number of alerts for this company. The parameters that were selected, were based on food-spoilage temperature thresholds, and using one year worth of data.

These thresholds needed to be recorded six consecutive times for the affected food to be considered waste. Once a load was considered waste, a two-day period over which temperature abuse was not being checked, was given to allow for stocks to be replaced – with the goal of avoiding counting that waste twice. However, what was available was the total amount of food (not amounts stored separately for each fridge and freezer). Thus, that total amount was divided by the total number of fridges and freezers for calculations. Tamiris showed then the updated results for each freezer/fridge.



The next step was to refine the parameters that were considered for these calculations because thresholds had been considered, but there were some food regulations in place. First, for fridges, it stipulated that they should be set at 5° C or below, and if food has been kept at 8° C or above for more than 4 hours it should be thrown away – that needed to be taken into consideration and update the results. Second, for frozen food, it was considered that food should be safe in a half full freezer for 24 hours without power. Tamiris explained that, for the calculations, only one hour had been considered – this also needed to be updated. Finally, many foods and beverages were safe to refreeze if kept between -17.77 and 4.44° C. Updating this was a further next step. Tamiris also mentioned that trying to get data for each of the fridges versus the total amount would also help refining the results.

For Burns Farm Meats, Tamiris showed the LCA inventory that had been previously developed. Recently, some trim loss data had been collected and thus the amount of waste for each carcass was now known. She then presented the updated, new results (e.g., Kg of CO<sub>2</sub> eq.) for this company. As a conclusion, the total carbon emission avoided by the project had changed substantially compared to the previously reported results. The new total was around 1 Mt of CO<sub>2</sub>.

As for future work, the next pilot test that was going to be assessed was Musgrave - pending on receiving the relevant data for the calculations. After the presentation, James and Tamiris agreed that the number of alerts may had been overestimated, and some of those parameters needed to be tuned. Ram asked Tamiris if the code for estimating alerts could be shared to partners on SharePoint.

Activity 2 will include the future improving of REAMIT technologies.

#### **Speaker: Xavier Cama (UCD)**

Xavier started presenting on D2.1 and explained that the current REAMIT technologies report was being informed by the quantitative survey that was performed at the end of 2022, led by both BED and UU. A quick, initial overview of the responses was provided and included: a total of 315 responses had been obtained from the company Survation; 48% of the surveyed companies currently were using IoT sensor technology; and amongst IoT users, a 75% were automatically monitoring temperature and a 72% humidity.

Examples of the statistical analysis that had been carried out to date from the quantitative survey results included:

1. Taking company types - processors, retailers, production, logistics, etc - versus IoT usage. In that case, a low correlation and no statistical significance were observed. Graphs plotting one question against the other were shown: it was possible to see that retailer companies had the largest percentage of “no”, i.e., they were not using IoT sensors for preventing food waste, while processors had the largest percentage of “yes”.
2. In a similar fashion, an analysis using business turnover - approximate turnover in the last financial year versus IoT usage - showed statistical significance, although the correlation was not strong.
3. Two more examples included: future IoT adoption, that is, whether companies declared intention to use them in the future, versus cost perception, i.e., if they thought it was going to increase their equipment costs. This correlation test showed a higher correlation than previous examples and statistical significance. The other, final example was checking for correlation between layered questions (constructs). In that case, averages for two constructs had been obtained and tested for correlation. This showed the highest correlation coefficient of the provided examples and statistical

significance. The two constructs used were environmental awareness – a group of questions related to commitment in becoming less environmentally impactful – and future IoT adoption, whether they were going to use it in the future and what benefits/purpose they would accomplish with it.

Usha (NTU) and Ram provided feedback on the analysis and observed that it was lacking a theme behind it, that it needed a purpose or goal in what it was trying to provide an answer for. While it was good work, it needed to be continued and given a stronger direction. Lakshmi (University of Essex) asked to be mindful on how constructs were treated for the analysis.

Elaine found that some interesting insights could be taken from the analysis. She added that besides looking at the turnover of companies, analysing IoT usage by the company's size would be interesting for the project. Turnover did not necessarily represent the size of the company, thus using the size could help understand an important element for REAMIT: it would be interesting to see if smaller companies would be willing to adopt IoT sensor technologies and try to determine how could they be incentivised to implement them, measuring their food waste, and acting upon it. Elaine concluded that this would be an important outcome/legacy of the project.

James confirmed that question no. 3 asked on the company's total number of employees, so that question could be utilised for analysis.

A more comprehensive analysis was available in a spreadsheet developed by Tamiris Da Costa and could be shared with partners.

Xavier presented on the future of REAMIT technologies part of D2.1:

1. To inform this section, quantitative survey responses relating to the future usage of IoT may be used to inform about the future of REAMIT technologies.
2. Ram observed that this (i.e., survey responses relating to the future [...]) research question was interesting and that the statistical analysis that had just been presented was well fitted to answer it.
3. Additionally, the systematic review prepared for WP T3 activity 1 may contain useful information to feed this deliverable. Some insights can be extracted as for communication technologies (CT) and sensor parameters. Xavier showed a table extracted from the systematic review, and thus from data available on the literature (N = 59), taking the year that papers were published and the CT that they were experimenting with for their IoT architecture to form a ranking of CT popularity in recent years.
4. Finally, a literature review taking information from research articles, white papers, and news articles would also be conducted to complete D2.1.

The Activity 3 related to Market assessment and included D3.1 (market readiness report, a market analysis and foresight report identifying forthcoming opportunities for REAMIT technologies to be developed into marketable products).

**Speaker: James Gillespie (UU)**

James presented on D3.1 and showed partners the document that they had been working on over the last few months. The report was divided into the following sections: scope of the study, problems surrounding waste in the food supply chain form “farm to fork”, and potential solutions linked to Sensor Technology Options on the market.

These 3 initial sections had already been populated and largely informed by some of the papers published by the REAMIT team in *Sustainability Journal*.

Outline of the Pilot Trial companies – for this section, Osterwalder canvasses were being developed for each of the pilot test companies to provide an overview of their business models. After that, they were looking into the SWOT (Strength, Weaknesses, Opportunities and Threats). According to James, this section was going to be lengthy and could have repetition with other deliverables as they were providing an overview of the company and all the activities that REAMIT carried out with them, e.g., lessons learned through the experience of the pilot test would be included as well, which would be very similar to one of the WP T1 deliverables. As Emmet (UU) was carrying out interviews for the qualitative survey, he would help populate the rest of the business models not yet filled out. James also asked pilot leads to help populate the parts corresponding to their pilot tests.

Future Market Scalability (Readiness). This section was going to inform the market of potential for the technologies to reduce waste, improve quality, etc. There was going to be a wider application/scalability of the technologies employed in REAMIT within and across other business sectors. The first thing they were looking at was the feasibility or key learnings of the REAMIT technologies. This was helped by the motivation paper led by Ram and the review paper led by UU. After this, and as a last part of the document, they were developing a “Market Readiness in the Industry Sector” subsection. For this, UU was expecting to utilise the results/data of the ATOM model as well as data from interviews (as for qualitative survey). The market readiness analysis that was being performed was trying to answer whether the industry was ready for the integration of IoT monitoring systems in the supply chain. The quantitative survey which yielded 315 responses could help inform the market readiness. For instance, when trying to answer if the product or service was solving a real need, it was possible to use survey questions and their corresponding company responses such as the one that asked “we believe that IoT provide us with the following benefits” (5 options were given for companies to choose from). Another analysis could be to study if companies were currently monitoring food quality parameters and if they were employing IoT to do so, and what would be the benefits of using IoT, among other options.

To help supplement the deliverable, Ram recommended a research paper by Yan (BED) and some of her information science colleagues published in 2019 on the future of information systems – which turned influential in the field. They made some assumptions about the future and proposed solutions while obtaining data from published literature for discussion. Ram explained that he thought of the deliverable containing four or five assumptions/proposed outcomes and the report providing solutions/discussion around these as in the paper by Yan.

Elaine (UU) congratulated the work carried out so far on the deliverable and agreed that it could be a good idea to frame the outcomes in Ram’s suggested manner; that it is conveyed that the work carried out in REAMIT has a continuation in the future in terms of reducing food waste and increasing food quality.

James had spoken with Emmet about the development of a paper coming out of the qualitative survey work.

James then started presenting on Activity 4 (*Development of business case*). It included: D4.1 – business prospectus and D4.2 – business case for achieving 40,000 tonnes of waste reduction.

James informed that not much work had been done so far on these deliverables and it would be good to come up with a plan around it. D4.1 consisted of an outward facing document to be made available to SME technology developers, to potential buyers of technology approaches and investors for the product development. Elaine had proposed a high-level structure for this report utilising the MRL (deliverable from activity 3) report to build upon. They had thought of three headings already:

- Market conditions – current and future. That is the criticality of food waste reduction, which they were hoping to get pilot test companies to help on that, plus the use of the quantitative study.
- Market solutions. The scalability of tech across/within the industry sector and transnationality.
- Funding requirements. A cost/benefit perspective, by which pilot case studies, knowledge as to costs of the IoT sensor implementation coming from WPT1, as well as the quantitative survey could be used. Finally, there was also the need to discuss the risks.

D4.2 was a business case using REAMIT data from continual monitoring of sensor data for identifying potential food waste (FW) and analytics to understand patterns of FW in NWE with justification for saving 40,000 tonnes of FW. James explained that the calculations made by Tamiris should help inform the justification of FW reduction, especially the ones based on the new alerting criteria.

Ram expressed that utilising the number of alerts as an indication for FW reduction was very useful and needed to be built upon.

Elaine asked Ram if there was any strategy for dissemination as for the business prospectus, how to make sure it reached the important people – investors, firms, etc. Ram explained that one approach was the search for new funding to keep on developing related work in the future; another approach was using those outputs that could be relevant for policy making and make them available to policy makers – Ram had tried to produce one for the UK parliament. Ram had been further provided with a list by a team at University of Essex of relevant actors whom to send these outputs, in terms of policy making.

James inquired on the possibility of getting support from the other institutions listed on the deliverable description to complete these reports. Ram offered support and asked James/UU partners to simply communicate what tasks they needed help on.

Lakshmi explained that for their ATOM/MOAT study they had performed a demographics analysis and established a demographic profile. After that, they had studied all the questions in depth to get a higher understanding of them as well as the questions in the form of constructs. They had been testing for correlation between the items, as well as the validity and reliability of the results. They had found that they had to eliminate a few of the constructs and items to obtain higher results in terms of statistical accuracy and validity. A modelling approach to identify the level of variance that dependent variables had based on the independent ones had also been performed. Now, she concluded, they were coming at obtaining a linear model, although future work may include other types of models being developed.

Ram commented further that, at first, the model was very complicated and gave problems in terms of statistical fitting. Therefore, they had come up with a linear model, although simpler than what they originally intended or planned.

Lakshmi mentioned to the group that she would not be using question number 23 of the quantitative results, if other teams could analyse it could provide insightful outcomes.

As a conclusion, Ram observed that a meeting amongst WP T3 members could be held to discuss the model and results and how to progress going forward.

## **Day 2. Thursday, 23 March 2023**

### **9:00-10:30 WP T1**

Gael started his presentation and described the deliverables: 3.2 and 3.3. Gael asked partners to save their contributions to WP T1 in the SharePoint.

Presentation of pilot tests

### **Picnic**

Since there were no updates since January 2023 regarding Picnic, Imke didn't prepare the slide presentation. She contacted Picnic, but it turned out that the company is not interested to continue its collaboration with REAMIT. Several trips to find new data are planned. Imke contacted Frank, but he will not be available in his office until next week. She has a lot of questions, for instance how to proceed. She wants to know if we want extra data and the durability of sensors.

Kate asked Imke what she is expecting from this pilot test. Imke replied that they want to have more data on the sustainability of housing.

An Excel sheet which included some requested data was sent out. Jean Charles is expected to work on this data too. So far, the data is of poor quality. To improve it and to provide a good quality analysis, Jean Charles explained some faulty sensors and there are some problems related to temperature. It is possible to focus on the sustainability of housing within a month in a good condition. In 2-3 months, it can be done.

Usha asked for extra data to be considered for publication purposes. Imke replied that she will contact Picnic next week to ask about some additional data. This data could be even in Excel format or any other kind of data available.

### **BioGros**

Since January 2023 there were two meetings of Whysor with BioGros. Imke asked for the next steps after the end of the project, and she is waiting for their reply. There is a question survey James worked on – it needs to be translated. She thinks that the company doesn't find the benefit of it. So, the company is more interested in working on sensors, rather

than developing the case study and the survey. Jean suggested that it is still possible to generate data and she will email them to find it out.

### **Raman**

Omar started the presentation and explained recent updates on the pilot study run by the University of Nantes. The study that involved Raman started in March 2020 and they worked with different pilot companies. Omar presented the methodologies and showed the video. Four posters, four presentations, and three videos have already been delivered. The methodology that all pilot tests relied on, was divided into three stages. Stage 1 – lab development, stage 2 – transitioning phase, and stage 3 – test in real conditions.

Omar mentioned some of the collaborators and pilot tests such as IGRECA, and Pescanova. They supported the stage 1 until 2021. Vivo is another pilot test (potential) company and a project proposal was developed by UoN. The proposal focuses on the portability of Raman and simplifying the analysis. During the Colchester meeting, UoN received an email that their proposal has been accepted by the funder (regional innovation fund in France managed by French local government). Kate asked a question about the size of the proposal. It is about 60 000 Euros worth, and the length is 18 months. This will be mentioned in the final project report under WP Long Term and ‘rolling-out’ of the REAMIT approach.

### **HMF**

Kate started the presentation. She mentioned that the sensors are working and the data analysis team is involved. Natalie expressed an interest in new smaller sensors. Marcel said he can install new sensors. Regarding the closure of REAMIT, Ram suggested not installing new sensors. Kate spoke to Tamiris about new proposals involving HMF. This could be founded by the UK and Ireland from the Peace Plus Programme.

### **Yumchop**

Sahar provided an update about Yumchop. She explained that Elsy-ELT-1 sensor that provides analogue and digital signals. Kate met Abi at an event at BED on women entrepreneurship in agri food sector under AWARE project. Abi asked Kate if REAMIT can install 2 sensors in 2 vending machines and one sensor in a van delivering Yumchop’s food to Sainsbury’s. Kate confirmed that James and Xavier are going to install a new sensor in Yumchop’s vending machine at Victoria Coach Station, London on 24<sup>th</sup> of March 2023. During the Colchester event, REAMIT team visited a shop in the UEssex campus with a freezer filled with Yumchop’s frozen meals, sold to students in the campus of the University of Essex.

### **WD Meats**

James started the presentation and explained the steps before the end of the project. This includes: performance of a baseline trial with full weight traceability; performance of the second trial with the parameters of the dry age chamber adjusted; and performance of a comparison study with data collected from Burns Farm Meat.

Related to Clostridium, if there is troubleshooting, they can provide support. There is frequent communication between Caroline and Victoria, and it helps WD MEATS detection of Clostridium.

James visited Musgrave in February and replaced the batteries. The loggers were back online. Also, the sensor location was moved so that the 'air on' was monitored. Andy Keery said it is a good location to monitor the ambient temperature. A new dataset has been captured with 1 month of data. The sensor was attached in a real location. James planned the second pilot called Artisan Click and collect food service, between January – March 2023.

On 4 January, James moved the loggers into a second cold store for a click-and-collect artisan food service based in the greater Belfast area. Andy confirmed that the cold store is going to be moved to Biosearch, a testing lab will be based in Belfast.

James explained that for his future publications, he needs more data and that will be beyond the project.

### **3DF**

The pilot data consists of 3DF technology to reduce food waste-2\* FreshDetect BFD-100. 3DF sensors can be used to make determinations of total bacterial count on products or liquids. So far, a few steps were made. First, a proof concept study was run at UU in February 2023 to see if the FreshDetect could be used to detect quality degradation in milk. Second, data were collected on three samples of full-fat pasteurized milk over a period of 7 days. Five scans were taken each day. Next, the milk was left unrefrigerated in a warm laboratory to encourage bacterial growth.

Before the project closure, Omar will assist with analysis of milk data and determine if the FD has been able to identify any peaks outside of signal intensity decrease. Also, Omar now has the second FD device. Omar and UU will collaborate on this study.

### **Burns Farm Meats**

Xavier started his presentation and provided a quick overview of BFM, and the sensors and gateways. Xavier presented the diagram of the architecture and showed the big chamber with six sensors and their locations. The additional four sensors were installed in the smaller chamber. Temperature and humidity sensor data were successfully recorded on 7 September 2022. Humidity readings consistently give values higher than expected and there is a lack of some information to link temperature/humidity to food loss during the dry aging process too.

The ongoing Eagle logger couldn't be deployed due to network issues. There is a need for alerting system that takes into consideration their cleaning, loading, and procedures. A switch/binary sensor was installed and attached to one of the already existing sensors in a large chamber. The Eagle logger could not be successfully configured. There is a need to deploy new sensors to use the Eagle logger offline. Weight data and water loss were recorded.

Ten sensors were deployed and Imke suggested Xavier asking for the connectivity of sensors. Davinder asked Xavier to send him the organizational IDs. Yan asked about how data have been achieved. Usha explained that Ram decided about discontinuity after March/April and that further investigations can be done in the future.

Kate suggested a new section in a storytelling document to capture the potential next steps for each pilot test. This will be helpful for the final project report and for developing future project proposals.



**Action: All pilot test leads to add a section in the Story Telling Document: ‘Next steps’ for each pilot test.**

**Guest presentation by Dr Giovanna Bono, Research Development Manager (EU & International), Research Enterprise Office, University of Essex**

The presentation focused on funding streams under the Horizon Europe Programme under ‘coordination and action’. Materials provided during the presentation by the presenter have been shared with the partners.

**11:00-12:30 WP T2**

**REAMIT data analysis of each sub-group**

**Raman Spectroscopy by Jean-Charles Vialatte**

This section of the meeting started with a presentation on the Raman Spectroscopy pilot by JV. JV commenced by presenting various tables of the raw sample data. JV showed raw sample vs. pre-processed sample data. JV would like to quantify if we can define quality levels using this data? Can we find expert rules to assess the quality level of a sample? These questions were explored during JV’s presentation. JV concluded that food quality deterioration can be observed in Raman spectras. Most of this work concurs with the studies carried out by the University of Nantes. We are able to define quality levels and spectra samples can be split between these various levels. Most of the insights are derived from the analysis on the whole spectra but we can refine this analysis by the specific peaks. OD and JV will carry out further work on this assessment model using automisation and on-edge implementation.

AA elaborated on JV’s presentation and said this new project they will launch is to have a smart interface, and to automise the processes.

**HMF and Yumchop analytics by Gautam Samriya**

GS started the presentation with the data requirements of HMF. GS spoke on how REAMIT will address the issue that HMF are having in their transportation and storage processes. GS said REAMIT is helping to optimise the quality of human donor milk and monitor the storage of the milk and logistics involved. GS explored the various stages of the data analytics journey with HMF. Once establishing the data requirements and challenges faced, the data variables was explored such as the quantity of milk stored, weight of the bags etc. The proposed analysis questions and possibilities include:

1. Real time alerting
2. A study of factors that could potentially affect the temperature of milk in bags.
3. Impact of seasonal variations on HMF’s operations. How does external weather affect total permissible journey length or time? Predictive model which can provide an estimated total safe journey distance/time given current weather conditions.
4. At what stage do the bags start to warm up?



5. Once sufficient historical data is available, can we predict the maximum time (or distance) once we know the forecasted for a given day?
6. Can we use the data to look at alternative routes? Can we combine with traffic information and better insights on routes?
7. SPC based analysis.

GS said that for each journey, as the temperature changes, we tried to correlate the different factors that are affecting the rate of change in on the temperature sensor data. GS Showcase the machine learning model on JavaScript. As for the Yumchop data, a preliminary alert set up has been created by GS. The shared data is from 10 sensors fitted at Yumchop.

### **Data analytics on Musgrave by James Gillespie**

Informing on the alerting criteria: JG spoke about the analysis of the sensor data collected so far at Musgrave. JG explained that the exploratory data analysis was performed on the full dataset. The freezers at Musgrave previously took 35 minutes to reach optimum temperature. Whereas with the sensor moved, the freezer reaches optimum temperature in 12.5 minutes. JG discovered that once they knew it took 12.5 minutes to reach optimum chill, they trimmed to data to reanalyse any journeys that were still in progress after 12.5 minutes. During these journeys, alerts would be sent whenever the temperatures spike past the thresholds. They later discovered there has been a cooling issue with the fridge units inside the vans at Musgrave, hence the poor performance until it was repaired, hence the multiple alerts they have received from REAMIT. JG would like to see if Musgrave finds a solution for their cooling issue within their fridges and hopefully this will allow for more optimal temperatures and less spikes. Overall, JG is happy with progress and overall reduction of the spikes in temperature.

### **Burns Farm Meats by Xavier Cama**

XC explains that the sensors have detected humidity readings have increased by 100%. The readings have been consistently higher than expected (between 75 – 80% according to literature). The main focuses are temperature and humidity data. XC showed a table of deboned and weighed hind quarter of beef and measured the trim-weight data. XC compared the costs incurred and the weight of the meat losses which clearly showed how the humidity is resulting in huge losses of resources.

### **Deliverables general progress**

Launch of smartphone APP (July 2022).

DB gave a demonstration on the Levstone app integration. The IoT sensors on the ground go through Digital Matter server, which then goes to Whysor and then to Levstone's server. External weather API has been installed into the app which is used through a journey task within the app. The HMF report and form has been integrated into the app. The app's reach has been extended to Bluetooth devices. Although, nothing is currently being used in a real pilot just yet.

DB stated that some of the benefits of the app is that each pilot test company will have use of a single application mobile app to view alerts pilot data in nearly real time. Each group manages their own resources such as their devices, users, tasks etc, access to weather API/Whysor API and other API interconnections to IoT devices. DB then proceeded to demonstrate how to use the app and its features. The plan is to work with HMF to

configure the application. DB will examine the pilot data from HMF and agree which data fields need anonymisation. DB has advised there is an 'App Installation and User Guide' uploaded unto REAMIT SharePoint and available for all partners to view before downloading the application.

YD asked for the end user, how easy is it to use this app? Is it user friendly? How flexibility is it for end users to adjust the temperature alerts and make changes. DB responded that tasks can simply be created by the controller. The application has simple steps for the driver to complete during the journey. YD said that there are different users for the app, the service user, service provider etc so it is a complex mission for this to be an efficiently functional app. YD asked if any of the pilot companies have tested the app yet? DB said the app needs to be tested in the field, so the next steps would be to meet up with HMF soon to discuss their usage of the application. DB went on to explain how the app will be presented to HMF in a forthcoming meeting. DB will bring a smart phone or tablet device to the premises of HMF, meet with Natalie and go through the processes.

**Action: HMF will need to use the Levstone app as soon as possible so we can get their feedback.**

#### **User Manual on launching the interface**

SA presented the user manual. She advised this document is completed and uploaded to the REAMIT SharePoint site. SA went through all the various pages of the user manual, to understand how to access your admin rights and how to access the BED Data server. Due to time constraints this was a brief presentation.

**Action: SA requested for all data analytics partners to provide some input on deliverable 8.1 and 8.2 – outcomes of your data analysis of your pilot tests.**

IH asked what this would mean for each partner involved in WP T2 as there was quite a lot of work put into the deliverables for WP T1, JG agreed he had contributed 40+ pages for WPT1. KP suggested that they recap and look at the deliverables for WP T2 in the REAMIT Application Form. KP sent the REAMIT application form to IH and explored all the WP T2 deliverables listed.

The status of the deliverables under WP T2 are as follows:

<b>Deliverables</b>	<b>Title</b>	<b>Status</b>
Activity 4	Develop an interface to collect sensor data and send to cloud	Completed
Deliverable 4.1	Creation and launch of interface	" Ask IMKE
Deliverable 4.2	User Manual on launching the interface	" Check with Gael

Activity 5	Development of Big Data infrastructure for analytics of sensor data and for rerouting to minimise food waste	
Deliverable 5.1	A big data platform with capability to collect and store sensors data from all REAMIT corridors	Completed (2 /1pages)
Deliverable 5.2	Reports on Big Data platform performance	Completed (Summary)
Deliverable 5.3	A web-interface with self-enrol facility for enrolment of potential suppliers and consumers of food produce	Ongoing (To work Davinder)
Deliverable 5.4	User manuals for the big data platform and the web-interface highlighted in the two deliverables above	Refer to appropriate sections
Activity 7	Development of smartphone APP for use by truck drivers and warehouses	
Deliverable 7.1	Launch of smartphone APP for linking to food owners, truck drivers and warehouses.	Ongoing by Levstone
Deliverable 7.2	User manual for the use of the APP	
Activity 8	Delivering the integrated IoT/Big Data technology with capabilities on analytics and decision support to help reduce food waste in NWE.	
Deliverable 8.1	Deployment of the integrated IoT/Big Data/analytics/Decision support technology	5-pages on data analytics and 3.2

Deliverable 8.2	A user manual for the integrated IoT/Big Data/analytics/Decision support technology	Refer to user manual [add a section on data analytics]
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SA said she added a link JG's paper but was advised to remove this. KP instead suggested to have a document for each of the deliverables and upload to SharePoint. KP said more detail is needed as only 2 pages was presented by SA for the deliverables. The meeting on WPT2 was stopped as a guest speaker came to visit the meeting so the WPT2 Meeting was cut short.

### 13:30 – 14:30 WP Management

Kate provided updates on the deliverables of work package management and status of various activities:

The project handbook is being constantly updated. The latest version is on SharePoint.

Minutes from the previous REAMIT meeting in January have been completed and shared with partners.

Over 20 online meetings of different groups have taken place.

Intermediate work package coordination: ongoing.

Risk register, risk review: Every six months BED and PPs update the risk log. It's in the form of Excel spread sheet.

Project reports: There will be nine in total. Currently BED and PPs are working on 4.1, 4.2 and 5.1.

Finance trainings for partners: Deliverable completed.

Kate presented yesterday the closure timeline of the project. Ram, Kate and Yan are meeting an Interreg officer in May 2023 (date TBC). Kate updated that the officer is coming to Luton for a two-hour meeting to discuss the project closure, deliverables and evaluation. She has sent along documents requesting all the information and all the evidence. This would be the final project meeting.

Yan added that now we are just waiting for the meeting with the Intereg officer. She said that we are hoping it's done before mid of May because otherwise it's too late. That is a critical meeting. She said we could maybe propose at least activity report by end of June (a preliminary report), so that we could have a free picture as well. She said we didn't discuss our finance difficulties, but we hope to get the reporting activities, deliverable and everything for reporting purposes before we meet the officer.

Usha mentioned that we covered everything thanked all for attending the meeting for the project.

**Action: All partners to complete on the spot audit before end of the project.**

#### **14:30 – 15:30 WP Communication**

Usha provided an update on the status of various deliverables in WP C.

Communication Strategy document: Usha explained that it was prepared some time ago and NTU is regularly updating it for every event. This document would be updated with activities regarding this RSC meeting as well, and it will be then considered complete.

Website Launch: Sasha updated that the website has been launched via Squarespace, but currently everything is being moved to over to a new platform called GoDaddy. This should not change much of the layout of the actual website itself, but it will just be a new hosting platform that will keep the REAMIT website live until 2027. The website will be live for a few more years after the project closure, for the legacy of the project, so that people can still visit the website to see the work that we have done.

Social media: Usha emphasized that everyone is aware of the importance of social media. She was happy that most of the partners have joined and contributed to sharing project updates on social media and all the partners have been very active. The number of social media posts in the past two months, from January, has increased threefold. Sasha has prepared a PowerPoint presentation to showcase the numbers related to social media and was excited by such impact on social media. She added that the PowerPoint has been uploaded to Share Point/module.

Posters and banners: in the most recent period, NTU has developed quite a few new things. Sasha highlighted in the last period, NTU did a lot of work for the symposium. They created new pilot test posters, such as for Picnic and Burns Farm Meats. Sasha also mentioned creating all the other posters from the previous period. They also created a new brochure and some print materials, that were made for the symposium. So quite a lot of new materials were made between July to December 2022. In current period (January 2023 onwards), NTU has mostly been working on more digital projects. They have prepared a digital timeline of project, which

is basically a timeline of the journey of REAMIT from the beginning of the project until its completion (January 2019 until June 2023).

Sasha has also been working on a new video, which is a new animated video like the interactive timeline. It's a short, animated video (approximately 2 minutes) showing the journey of REAMIT. Sasha highlighted that the new documentary videos have been released too. There are five new pilot test videos, and they are available on the REAMIT YouTube channel, along with different versions of the documentary that have been recently published. These have also been promoted by a press release through Nottingham Trent University. These are available on SharePoint too.

Policy briefs: Usha mentioned that these were already discussed yesterday. These can be seen in the folder against the communication documentation. The documents on these deliverables have already been uploaded.

REAMIT networking events: Usha updated that she has not made a separate report for this yet. She has added it to the CS document. Now, as NTU has got report for every event, they would compile everything and would create a separate document for this other than the CS document. Usha mentioned that herself and Sasha would work on it and its one of activities for them to be completed in next two weeks. It will also be uploaded on SharePoint.

Journal Articles: this has already been discussed.

Usha added that they have completed all the deliverables.

### Action log

Date	Minute/ Item	Action	Responsibility	Update
22.03.2023		Usha (NTU) to try to get NTU to agree to Yumchop's freezer installation at NTU campus.	NTU (Usha)	To be completed.

22.03.2023		NTU to led work on turning some of the story telling documents prepared for WP T1 into publishable case studies.	NTU	To be completed.
22.03.2023		All partners need to complete the progress report 5.2 on the eMS end of April 2023.	PPs	To be completed.
22.03.2023		All partners need to complete finance report 5.2 on eMS by end of May 2023.	PPs	To be completed.
23.03.2023		All pilot test leads to add a section in the Story Telling Document: 'Next steps' for each pilot test.	PPs	To be completed.
23.03.2023		SA requested for all data analytics partners to provide some input on deliverable 8.1 and 8.2 – outcomes of your data analysis of your pilot tests.	PPs	To be completed.
23.03.2023		HMF will need to use the Levstone app as soon as possible so we can get their feedback.	Levstone	To be completed.
23.03.2023		All partners to complete on the spot audit before end of the project.	PPs	To be completed.

## Annex 2. Notes from monthly meetings of the REAMIT team at BED.

### Minutes of meeting, 15/04/2020 via Skype with BED REAMIT Team

**Participants:** Tahmina Ajmal, Lohithaksha M Maiyar, Yanqing Duan, Katarzyna Pelc, Ram Ramanathan

1. Ram notified all that he is receiving daily check-ins from Lohit, Kate, Yan and verified the same is the case with Tahmina at her department. Ram reassured that it is important to stay safe at these challenging times especially with rising cases of fatality within partner institutions due to COVID-19.
2. Lohit has started preparing two tables: 1. List of Equipment's and their quotations for Big Data hub 2. No. of users that will require simultaneous per pilot test. The first table will be forwarded to all BED members before forwarding to the financial team. Ram suggested that an opinion of other technical REAMIT technical partners (Whysor, Levstone, SenX, and IT Tralee) can be taken for preparing list of quotations. The second table will be helpful to decide the capacity of the hub. **Action: Lohit**
3. Lohit was suggested by Kate to send an email to Khalid and Tracey Williams to know further about University procurement status. YanQing and Ram instead suggested to send a blanket email to all members of financial team (including Khalid, Emma and Claire) to [facultyfinance@beds.ac.uk](mailto:facultyfinance@beds.ac.uk). Yan will send an email to Lohit about relevant email information (Already sent and received by Lohit). **Action: Lohit**
4. For Lohit's Laptop Kate suggested if the requirement is immediate, could he buy on his own and be reimbursed later. Ram opined that this would be a risky strategy to go ahead with and would be best to wait until University reopens or Lohit could further communicate with the concerned IT person for other suitable options considering current situation. **Action: Lohit**
5. Kate received an update from JS that she has refused REAMIT second report and requested for more detailed information. One of them was regarding the advertisement hosted by each partner about REAMIT project. Kae has sent an email to all partners regarding forwarding their own advertisement links to BED and set up one and forward the same by this Friday (17/04/2020). JS has notified Kate about approximately 7 additional points including specific payment claims which will need further clarification from individual partner institutions (to be followed up by Kate). **Action: Kate**
6. Ram submitted the REAMIT COVID-19 impact assessment summary document prepared by Lohit and forwarded to Gerry. Ram has communicated the interest for an extension of approximately 6 months to 1 year to deal with delays based on suggestion from Shane Ward. Ram wants to ensure Kate and Lohit are available and paid during the extension period.
7. Steering committee meeting planned in July could be postponed or alternatively held online. If all is back to normal, Imke has been requested to arrange visits to sites of the Dutch and German pilot tests.
8. Research can be made a priority during lockdown period. Ram requested all to put forth their ideas in the days to come and welcomes everyone to think towards writing papers/articles capitalizing on information/experience gained so far from the project. Sensor review paper has been forwarded to



Lohit, asking him to discuss further with William to improve the current version to a good journal paper. Ram suggested to conduct additional meetings to discuss more on this. Lohit suggested couple of ideas for research and was requested to share those to the group in a document. Ram suggested the idea of contributing to calls from some specific journals (International Journal of Operations and Production Management). He was open to share the details about these details. Some suggested areas were REAMIT fostering innovation in Agri-business supply Chain. Ram is also working on game theoretic model with other scholars to see how additional information can be useful to increase returns to farmers, insurance and truck companies. **Action: Ram and Lohit**

9. About proposals, there are some rapid calls about COVID-19. The proposals to these may have high probability of success if the proposal intends to deal with secondary data.
10. Yan suggested Lohit to provide a list of ideas may be inspired from REAMIT which can be possible future directions. She appreciates the research conducted on the technical front but suggested to keep in mind the humanitarian perspective or the business school perspective (technology implication, human interaction, benefits to stakeholder) while devising the research work. Kate agrees to the need for bridging the gap between technological and human behavior aspects and is important to engage the key players and the dialogue between them.
11. Capitalisation call may be delayed but this needs to be checked with the JS. **Action: Kate**
12. Ram proposed further meetings can be held once in two weeks for every Wednesday in between 11 to 12 am. Lohit has agreed to set up the meetings on Skype for business. **Action: Lohit**

## Minutes of meeting, 13/05/2020 via Skype within BED REAMIT Team

**Participants: Tahmina Ajmal, Lohithaksha M Maiyar, YanQing Duan, Katarzyna Pelc, Ram Ramanathan**

1. Kate reported about the progress of REAMIT report submissions are going well and has some quality issues (raised by JS for the second time) that needs to be resolved during report submissions from the partners. Ram suggested that training might help to update the partners about quality standards and directing them to relevant manuals, powerpoint etc. Kate suggested it would be good for Charmaine Guyo and Steve who are currently doing the submissions at BED, check the reports and appraise the partners so that they can rectify any errors before uploading the reports to EMS portal. Ram suggested Kate to enlist some bottlenecks/points/areas of improvement and discuss with Charmaine Guyo and Steve if required to clarify this to them before appraising the partners. In doing this, Kate need not do the submissions by herself but inform them about the vulnerable areas that needs rectification from partners. A video/pdf documents explaining this would be helpful to which the partners can refer to.
2. Ram said that the next RSC meeting planned in July most likely will not be held physically. It could be either postponed to September or could be held online. Ram prefers the second option to enable partners to use this opportunity and share more about their current updates and experience in dealing with COVID-19. Others agreed to continue with the online meeting. The feedback from this meeting can be shared with JS.
3. Lohit updated that he has finalised the draft quotations of purchasing Big Data hub and sent to Whysor, Levstone, SenX and ITTralee. Tahmina suggested that once we have a response from these partners, we could set up a call with Rob to discuss further on this.
4. Ram said that the purchase order for Lohit's laptop was placed again after approval because of the first one being cancelled due to internal misunderstanding. Lohit mentioned that the price of the laptop is slightly changed (increased by GBP 2) and hence is awaiting the reply from insight employee to see whether they are able to process with the PO which was raised based on old pricing.
5. Lohit updated that the questions for improving the sensor review paper are ready now to be shared with Levstone and Whysor. Lohit asked about who will be sending the email to which Ram said that he wants Lohit to take lead in this which will help him establish as an independent researcher.
6. Ram updated Lohit about the requirement to develop the following: (1) Probation booklet (2) Performance development appraisal (3) Workload planning. These three are mandatory steps to prepare to register as an independent researcher for REF submissions. For this, it is important to show that a minimum 25% time is allocated for Research in the workload (However, it is 100% in his case). Lohit should start to complete the above steps by visiting the links shared through email. Ram may be needed to generate and send a link for Lohit to be able to complete the PDA. In case if Lohit is unable to do by himself, Ram is happy to help. Lohit can book an appointment with Ram separately or use one of these meetings with prior notice to conduct a 3, 6, 9- and 12-month review meeting.

7. Ram is going to submit the special issue proposal to EJOR later during the day. Lohit suggested Journal of Management Information systems (published by T&F) as a possible consideration for special issue submission if found relevant for the current proposal. Tahmina mentioned that there are many special issues coming up in reputed journals. Ram requested Tahmina to share those special issue calls which can be used to develop the current proposal.
8. Happy lunch wishes to all from Ram and Lohit will be sending an invite to all for the next meeting to be tentatively held on 27 May 2020 from 12:00 pm to 1:00 pm.

## Minutes of meeting, 27/05/2020 via Skype, BED REAMIT Team (15.00-16.00)

**Participants:** Tahmina Ajmal, Lohithaksha M Maiyar, YanQing Duan, Katarzyna Pelc, Ram Ramanathan

1. Some of the Universities have started to work from office. While the University of Bedfordshire administration is undergoing discussions to allow researchers who want to be at office, there is still a confusion about how safe this approach is especially with no concrete guidelines for its execution.
2. Kate has received an official confirmation that Dunbia is exiting and has signed off from the REAMIT consortium and will need to update the JS about this. UU is taking over the corresponding budget. Kate is preparing a draft document to showcase specific misalignments in report submissions to SenX and Levstone (Kate: kindly confirm name of companies). There is a delay in the release of funds because of administrative process delay. Today the Dean has approved the release of funds and is currently with Steve for processing. This will need constant chasing of the financial team to expedite such issues.
3. The online meeting is planned to be hosted during 8 – 9 July and all are requested to book these dates. Ram insists it should be ensured that the whole two-day event is planned and should not be watered down to couple of hours or half a day event because of having no progress on pilots. Ram suggests conducting advisory meeting in the morning and work package meetings in the afternoon. Tahmina suggests that it would be good to invite experts or end-user experiences, technology providers to engage all the participants. Ram suggests that Whysor take the leading role in organizing this as planned earlier except that there might be a change in the way of conducting because there will be no physical meeting/room booking etc. and will have to organize it online. It is advised to go for a subscription based than a normal service. LP should take a less leading role and should allow Whysor to lead the event.
4. Kate, Lohit and Ram will have to prepare the report and forward this to all partners so that they can prepare their reports by referring to ours as an example.
5. Ram suggested if employees who are majorly dedicated to REAMIT (Kate and Lohit) can purchase workplace facilitating furniture such as a chair or any other required item to work from home under the condition that they be returned to the University after reopening.
6. We will have to communicate to the JS for an extension for a period of 6 months, preferably a funded extension. If there is a no cost extension, Kate and Lohit to be paid from funds saved from the period before they were employed. Tahmina pointed out that in one of the projects she is aware of, the PI has asked for an extension and they were given a no-cost extension. Kate pointed out that we may need to also consider the concern that the funding program needs to close their accounts. Ram is aware of this but is optimistic about a change in the regular procedure considering the special situation. We could use the progress report as a proof of having no progress during these periods.
7. Lohit is settling with the project and working procedures. Lohit said the new laptop is working nice and is setting up softwares. It was recommended by Ram that only UoB approved softwares be installed on the laptop. Microsoft Office license is freely available which can be installed on any personal computer.

8. Lohit mentioned that we have received a positive response from the technical partners about the draft specifications of the Big data hub. Based on the comprehensive opinion it was agreed to go for an integrated system. The draft specification will be finalised by the end of this week and be ready for placing a purchase by first week of June. Kate pointed out it is important to show evidence of approaching 2 or 3 suppliers as appropriate to satisfy procurement guidelines of the auditors. Ram insisted to take a decision soon on this.
9. About research, Lohit is preparing a model to capture/quantify quality of food and is formulating a decision model to analyse the food loss taking an example scenario similar to what Whysor is dealing with.
10. Lohit shared that he has not received a reply to the questionnaires sent yet and will send a reminder. It is important for Lohit to take active steps, treat himself as a PhD student and establish contacts. It is required for him to chase Whysor and engage them in an online meeting rather than asking them to answer the questions. Ram suggested to ask Whysor to recommend at least six other companies for interviews. YanQing may be approached who is an expert for performing a qualitative analysis. But it is important to conduct interviews before that so that paper can be ultimately prepared the paper for BJM.
11. Lohit proposed to submit an abstract to INFORMS conference, but REAMIT has no funds for physically attending the conference. Nevertheless, participation in a virtual conference is encouraged.
12. Ram will be sending the revised COVID-19 proposal which will need additional work to be done. Many projects have been accepted and there is no single project with the technology focus and hence the current proposal stands a good chance.
13. The ICT 2020 exhibition draft form was forwarded by Lohit and comments will be given after the team goes through it. Ram suggested that 2 other partners may also be interested to join out of Whysor, SenX, I & R and GIQS. Kate suggested that there will be at least 10 mts x 6 mts stand space and hence a generous number of laptops and monitors may be proposed to carry. Ram finally suggested 3 laptops, monitors, a demonstration sensor kit. The demonstration kit may be requested from our technical partners which for example could demonstrate and predict quality for an apple using sensors.

## Minutes of meeting, 10/06/2020 via Skype within BED REAMIT Team

**Participants: Tahmina Ajmal, Lohithaksha M Maiyar, YanQing Duan, Katarzyna Pelc, Ram Ramanathan**

1. Kate has confirmed that she has submitted the papers relating to the exit of Dunbia to the funder and they are processing it. She can see the changes in eMs portal.
2. The process of financial approval for disbursing funds to partners is delayed and not yet completed. Kate will send an email to finance for following them up to expedite payment. Ram insists on finding out bottlenecks for avoiding delays next time and prepare a detailed flow chart of workflow from the receipt of funds from the funder to dispatch of funds from lead partner. Ram says we need to keep pestering the finance team for updates on the processing of funds. Yan also pointed out that they make lot of errors, hence would need constant chasing.
3. All REAMIT fixed term staff from UU, NTU and BED had a meeting on 9 June 2020. Ram suggested for this meeting to ensure exchange of ideas and to keep track of progress of each partner. It is advised to assist Sasha in generating more ideas for communicating project progress by suggesting her to prepare infographics, attractive professional looking diagrams for research papers, REAMIT videos etc. These ideas can be communicated to Ram who would forward it to Usha who is her line manager.
4. For the next newsletter to be prepared by Sasha, Ram approved that the COVID assessment report prepared by Kate can be used for the newsletter while maintaining the names of concerned or affected partners as confidential. Kate suggested that current paper works being conducted by Lohit and our REAMIT team can be also highlighted in the newsletter. There can be more insights from pilot tests which could be also included in the newsletter.
5. Sasha also has prepared another report to describe impact of COVID-19 on food supply chain which she suggests publishing on the REAMIT website. This is in a draft stage and seeks guidance to improve it. Ram is ok with it and suggested that she can also target to publish this in a journal with some ISSN number, not necessarily a reputed journal.
6. Kate pointed about the elevator pitch for REAMIT, which is the action for NTU. Ram suggested to go through this in further detail and discuss in the next meeting.
7. Kate was interested to meet an auditor to get herself trained in the auditing process. She was declined the request to meet an auditor by the finance. Ram suggested that it is better to not to be too close to the auditor because it is a sensitive issue an extra layer between PM and auditor is advised. However, if Kate wants to train herself with auditor on any specific issue, Ram is happy to try to create an opportunity.
8. The agenda for REAMIT steering committee meeting to be held on 8 and 9 July is being prepared by Kate and will forward it to the group for suggestions. For the online meeting platform, Microsoft teams may not be available to all. Zoom is preferred by Ram considering its ease of use and for the fact that Yan has already purchased it recently. Ram is willing to approve purchase of the zoom if it is ok for all partners. In any case, it is best to take opinion of all partners before finalising either by a mini survey or by contacting them for any particular option (zoom or Microsoft teams). There is a chance that technology partners may have a better idea. The content of the steering committee meeting will be 1. Advisory committee meeting and impact of Pandemic. 2. Work packages to discuss

progress and impact of pandemic. 3. Talks by Whysor on Dutch pilot study, Imke can bring picnic on board. William is going to speak to WD Meats if they can make a presentation. Ram suggested to cross-check with University of Nante to bring STEF on board to make a presentation. Gael should be pushed further to generate another separate pilot test given that I&R and Valorial have significant human resources costs allocated to them and have not contributed much to the pilots. Kate mentioned that Gael invested 3000 Euros to hire an external facilitator. Ram feels the pricing is heavy and Kate agrees to it.

9. Lohit has pointed out that specification for Big data hub is finalised and now is ready for a purchase. Lohit suggested he can travel to Luton to collect the equipment, while Ram suggested to go ahead based on mutual decision taken by Tahmina, Rob and Lohit. Ram advised if purchase order could be processed and delivery be made at a later date, this would be the best option. Lohit and Tahmina agreed to this and Lohit will contact the supplier to ask if this is possible. It would be better if Kate could raise the purchase order and process it because the control will be within the team. Kate agreed and will learn to do it. If it is difficult, then Kate can also approach Carol to raise the PO. Ram suggested she can also purchase the zoom subscription by herself (if all partners are happy with it). Rob to be contacted for further clarification on post-delivery activities.
10. Lohit attended the Interreg Europe event but did not find any useful contacts. Ram said he will be forwarding a conference on IoT and sensors and encourages everyone to participate.
11. About the sensor review paper, Lohit has a meeting with Levstone and Whysor on Friday and Monday respectively for discussing the questionnaire. Ram suggests that it would be good if this can be converted to interviews. For internal partners, you need not bother about confidentiality agreements because they are already made at initial stages of the project. They need to be taken if there are any external companies participating in the interview. Ram offered to help if confidentiality agreements are to be taken in such a case. It is important to collect recommendations and specific contact details of 5 additional sensor companies from each of them for further interviews.
12. Tahmina, based on her experience from previous aqua-culture projects, is drafting another proposal with an African partner. Ram opines that it is good to have contacts and Ram says that he is going to initiate recruiting a Research Associate based on opportunities. Tahmina mentioned that she found a useful contact on aquaculture in the EPI centre. Ram mentioned that he is planning to prepare a Africa-Agrifood KTP (AAKTP) applications with South African partners.
13. Ram suggested it is important to keep searching and update each other on different new funding calls to target to achieve projects inspired from REAMIT. Ram insisted it is important to fund and keep Lohit and Kate on board after REAMIT.

## Minutes of meeting, 24/07/2020 via Microsoft Teams within BED REAMIT Team

**Participants:** Tahmina Ajmal, Lohithaksha M Maiyar, Katarzyna Pelc, Ram Ramanathan

**Apologies:** Yanqing Duan

1. On WP T1, the procurement of sensors for Whysor is under hold because of additional questions from the finance department that need answering. The Swedish company Elsys was not responsive initially but have responded to Marcel and Imke. Thus, BED hopes to procure these sensors soon after the questions raised by BED finance have been fully addressed with the help of Elsys.
2. Tahmina reports that 3D Fluorescence pilot has no progress yet based on the information from the meeting held between Tahmina, Lohit and William on 23 July 2020. It is important to select one of the recommended sensors (Flouretic, German company, or others), proceed to next steps. Ram suggests Kate or ask Gael (I&R) to follow it up with William/Joan every week until there is some progress made on this.
3. UCD has no update. Ram shared that Manor farms pulled out of another project consortium at the last moment due to some internal reasons. Ram suggests Kate to inform UCD to keep looking for other options than Manor Farms as he believes it is best to keep alternatives in hand if they pull out from this one too in the worst case.
4. No updates from German and French pilots.
5. Usha, NTU is trying to continue talks with Tesco, however due to COVID the communication is not very clear. If necessary, Ram suggests BED can also try to bring in some companies from the other projects. University of Lincoln can be approached to direct us to good companies as they are having a good network of contacts. Before doing so, BED will need to ensure if they have the required capacity to handle a separate pilot.
6. On WP T2, Lohit updated that the Big data hub equipment has been finalised with its software licensing. The revised quotations are forwarded to Kate for processing the purchasing. Kate updates that Khalid will be approached after a meeting with Lohit to clarify about the procurement checklist. Ram suggests Lohit also to follow it up with Tracy, finance if required. If Kate is facing problems, Khalid or Tracy or Carol can be approached to do the ordering for this time.
7. Lohit to meet with Levstone, and Whysor after procurement of the Big data hub equipment to discuss about receiving data from cloud, and to get updates about smart phone app development.
8. About the sensor review paper, Lohit updates that there is no much progress since the last meeting. Ram suggests at least 10 interviews should be conducted for useful results. On Lohit's question about how the paper's methodology will be focused, Ram clarifies that the paper will be empirical and not a review although the review will be part of the literature review to develop taxonomy of sensors. Since enough number of interviews were not conducted at the moment and given non-COVID-19 focus of this work, it is not now considered for submission to BJM special



issue on COVID 19. If there is any difficulty in finding companies for interviews, Ram is happy to help.

9. Ram also suggests writing a short paper/case based/position paper either targeting on COVID-19 related modelling and analysis or analysis inspired from our pilots or from combining both while targeting these short paper works to IJOPM's new short paper submission route. Two of our end-users have promised to conduct such study with us – Picnic and WD Meats. These should form two good cases and there should be at least 2 papers of such type in the next 3 months' time targeted for IJOPM.
10. Ram also supports and suggests Lohit to carryforward the idea of building a transportation model based on simulated scenarios inspired from WD Meats and Picnic pilots.
11. On WPT3, Gael and Joan to be chased for updates on French and UK pilots as it is important for the completion of these pilots for UCD to start the estimation of environmental impact assessment. The data required by UCD will need to be understood and requested from other pilots. Ram suggests Kate to spend an hour to chase/send reminders to different pilots every week.
12. Ram suggests Kate to approach UCD on the plastics project application and encourages to explore more of such opportunities
13. On WP LT, there is no update
14. On WP C, Sasha has modified and would be sending it out to partners. Lohit and Sasha preparing notes from the REAMIT meeting. Sasha to work on next newsletter for September. Imke to be approached for Dutch and German translations.
15. It may not be needed to print all banners, replacing Dunbia's logo with WD Meats is being considered to save costs of reprinting new banners.
16. Valorial removed Dunbia's logo but donot have WD Meats logo.
17. Ram presents the idea of green deal and is seriously considering submitting an application one they have more information from the funders.
18. Tahmina suggest that since most of the supermarket products are packed in plastics, the idea of using plastics to reduce degradation and extend shelf life and thus reduce wastage could be useful to showcase reduction in environmental impact.
19. Kate proposes the idea of collaborating with UCD and use their experience of imprinting bar codes or laser technology for reducing plastic. Iceland made a pledge to reduce plastic and the idea of reducing plastic would directly impact the environment and national goals.

## Minutes of meeting, 04/09/2020 via Zoom within BED REAMIT Team

**Participants: Tahmina Ajmal, Lohithaksha M Maiyar, Katarzyna Pelc, Ram Ramanathan, Yanqing Duan**

1. On WP T1, Last week KP sent out an email to all pilot test leads asking for update on developing pilot tests:
  - a) Pilot test with Picnic - BED has purchased 20 sensors and batteries from Elsys. They will be delivered to Whysor in second half of September.
  - b) Pilot test with Weyers - no progress - Whysor have not heard back from the company yet.
  - c) Pilot test with Raman - UoN team can work again at their lab at UoN. UoN have contacted other companies for pilot tests and are waiting their response.
  - d) Pilot test with WD Meats (bacteria) - UoN still looked for sensor to detect bacteria. Prof James engaged with his network to get help with identifying the right sensor. Whysor offered to help UU find sensors and/or ship Whysor's sensors to UU.
  - e) Pilot test with WD meats (dry aging chamber) - WD Meats did not respond to UU's emails for accessing the company to visit the dry aging chamber and see where to place sensors and how many sensors need to be placed.
  - f) 3D fluorescence pilot test - UU contacted companies suggested by Tahmina but had no response from them.
  - g) Cyberbar - no response from UCD
2. Whysor has number of data loggers to be sent to UU if needed. But, given that the funder does not allow fund transfers between sub-partners, Ram is happy to support Whysor in purchasing additional sensors at later stage and use the old ones now for REAMIT.
3. Whysor's sister company called Intelligent bond promised some Freshdetect probes, which can be used for 3D fluorescence pilots.
4. BED is liaising with another company called Yumchop to provide a platform for technology demonstration. They have applied for Innovate UK application on Block chain technology based agricultural systems and are interested to see collaboration opportunities with BED. Yumchop have agricultural set up in Zambia and have their own farms. Ram suggested Yan to liaise with Lohit on discussing collaboration with Yumchop on Innovation bridges. Ram clarifies that Lohit and Kate are welcome to take part in the discussions and work as part of the team for learning and professional development purposes but cannot involve officially as they are 100% REAMIT staff. Lohit and Kate are happy to join the discussions for knowledge gaining and explore such opportunities.
5. Ram suggested Yan about Imperial Agri-foods and to explore this opportunity with Victor and he would join at a later stage.
6. William has sent emails to companies suggested by Tahmina, but he received no response for 3D Fluorescence. Ram suggested that it would be better if William could forward those emails to Tahmina and approach the companies through her instead of directly approaching the companies, given the already established relationship of the companies with Tahmina. Tahmina is happy to help, but, given the recent developments, Whysor's sister company may be a good option. In this case, Ram suggested to explore both options.

**Action: Kate to send email to William to forward the emails through Tahmina if required (Done)**

7. On WP T2, Lohit reported that server equipment items are being delivered and two items are yet to arrive. Tahmina suggested to ask Rob's availability and visit the campus to discuss exact location inside room c111 for the server. Lohit outlined the next steps that once the server is delivered and placed in a safe location, he would raise a request to ICT to assign a IP address following which he will request the engineer to visit the campus to make the initial setup. Tahmina suggests Lohit to ask Rob if it was possible to install the server at his desk and then transported to the server room to avoid risk of infection due to close distances inside server room.

**Action: Lohit to send email to Rob for his availability and discuss with him the possibility of remote server installation and subsequent transfer to C111. (Done)**

8. The delivery of software license purchasing from XMA is being followed up by Lohit and will be delivered through email during the week. After the initial setup is made, Lohit will organise a meeting with Whysor and other technology partners to discuss about the architecture on receiving data to the cloud and then to the server at BED. Lohit pointed out that another reason for this meeting is to clarify the role of SenX in their support to UoN for establishing connection with the cloud along with Whysor. Ram clarifies that SenX will be majorly involved in data analytics, but not much in connecting to cloud. If they have been reported as supporting for this, Lohit may check this through the meeting. In addition to SenX, ITT and Levstone will also be part of conducting data analytics. Levstone will also be involved in developing a second database of transporters.

**Action: Lohit to followup software purchase with Albert, XMA (Done)**

9. Ram reminds that the template of confidentiality agreement with end-users is to be prepared. Kate suggests that there is a sample template developed UU for WD Meats which can be used as a good starting point.
10. In WP T3, no progress.
11. In WP PM, Kate to send a reminder to Levstone on FLC audit reports. No response from UCD over the summer on cyberbar pilot test progress, companies involved, Plastic Innovation Fund, etc. Ram suggests Kate to send a reminder to UCD and if they don't respond, he would approach them.

**Action: Kate to send email to UCD and Levstone for updates on FLC audit and pilot test progress.**

12. In WP C, Kate suggests topics for the next newsletter
  - a) Focus on promoting REAMIT symposium
  - b) Progress from July REAMIT RSC/WP/ RAC meetings
  - c) Introduce new and old colleagues of REAMIT project, starting with Lohit and then one each from other organisations in subsequent newsletters with headings like "Meet the Team" or "Meet the staff" etc.
13. Kate forwarded the communication team's concern about not many of them responding to the Food Questionnaire. Kate suggests that if all partners can be approached and requested to give at least 2 responses per person including from family and friends. Ram says that it may not be advisable to request partners to participate in this given that the original idea of the Food Questionnaire hosted by Sasha on the REAMIT website was to increase interaction amongst the visitors to NTU REAMIT event. Thus, may not be very informative and may not be of serious concern at this stage. Ram suggests Lohit and Yan to have a look at this and see if it can be further enhanced and promoted to attract more responses.

**Action: Ram, Lohit, Yan and Tahmina to review the questionnaire and suggest future direction. (Done)**

14. Kate wants to include Gael in sub-group meetings to increase involvement of I&R in leading WPT1. Ram suggests Kate to inform Gael to organise monthly meetings to have updates on ongoing pilots with all pilot leads.
15. Kate requests to send a paragraph on the presentation to be made at the Smart Food Conference for the newsletter.

**Action: Tahmina to send a paragraph on the smart food factory conference presentation to communication team.**

16. In WP, LT Valorial to confirm whether the REAMIT symposium will be held online or physically? Is there any role for REAMIT partners?
17. Lohit to forward the formulation on rapid response soon and is currently finalising it. On the sensor review paper, 2 interviews were completed, and he received calls for 2 more interviews and 2 others have expressed interest. More number of interviews are needed (at least 6) for writing up the paper. He will be sending out emails to more companies. The abstract submitted to POM has been rejected and will be improved to a full paper. The idea of working on two short papers is yet to be started and Lohit says he will work on them as soon as he completes the current research papers and by the time the pilots have begun. Ram suggest Lohit to conduct field visits if required and can avail funding for this. Ram is also keen to visit some of the pilot tests if possible.

**Action: Lohit to forward the rapid response modelling formulation.**

## Minutes of meeting, 29/09/2020 via Zoom within BED REAMIT Team

(15.00 – 16.00)

**Participants:** Tahmina Ajmal, Lohithaksha M Maiyar, Katarzyna Pelc, Ram Ramanathan, Yanqing Duan

### WP T1

- Picnic: The transaction for 20 sensors has been done. Elsys will be shipping the sensors soon. Yet to get conformation from Whysor about the confirmation of delivery of these sensors from Elsys. Picnic will need 3 weeks to configure the sensors.
- Weyers: Imke has confirmed they are happy to resume the pilot test and will send update the end of the week.
- UU: 3D fluorescence: Mathias promised to send 2 sensors to UU. They are currently sorting out the paperwork (warranty, insurance etc.). Ram suggests another route which UU can adopt to procure sensors, to approach a contact from AgriEU Food project. In summary, UU can explore following options:
  - a. Freshdetect from Mathias
  - b. FloretiQ from Tahmina
  - c. AgriEUFood project from Maastricht University

Ram says if the third option is found not convenient, they can still be used for the capitalisation call.

- WD Meats: They have signed collaboration agreement and currently off communication. They wish to resume the dry aging pilot after Christmas because they would be dealing with a generally high demand on meat business until Christmas.
- Clostridium trial: James is not successful yet in finding out the right approach to detect bacteria, other groups being contacted.
- William and Joan propose to approach different companies similar to WD Meats in the local area and find out challenges faced to maintain food quality, so that a database of such companies can be created. Ram welcomes the idea.
- No reply from UCD on pilot tests. They have not responded for Kate's last 3-4 emails.

**Action:** Kate to forward the latest email sent to UCD to Ram.

- The egg consortium approached by I&R and Valorial (France) is not interested in the participation in REAMIT pilot tests.
- Kate to contact CEO of an umbrella organisation of food producers, whom she met at the World AgriTech Innovation summit.
- Ram suggests keeping pushing French and UCD pilots for updates once every 2-3 weeks.
- Kate asks Ram whether it is the right time to start monthly meetings for WP T1 and to be coordinated by Gael. Ram says yes.
- Ram urges the need for contacting more companies as we have to prove that we have saved 1.8 mtons of CO2. Ram requests Kate to push NTU to get updates on Tesco/Pepsi.

- Kate: William wants to know if other type of sensors such as infrared spectroscopy can be used. Ram suggests Tahmina to comment on this. Tahmina says since the 3DF options have not exhausted, currently not required to be seen as a substitute but can be explored as a different option. Points out that if the application mentions 3DF, then we must go with 3DF or justify the deviation to other approaches. Yan and Ram clarify that the application does not mention 3DF, only mentions the use of advanced technology.

#### **WP T2**

- Lohit says that the big data server has been received and kept in the room c111. A visual inspection was made to see the suitability of the rack assigned to the server by Rob. Rob to assign an IP address in due course. The big data server will need significant input. Lohit is currently liaising with supplier to arrange a date for the engineer's visit. Lohit is also liaising with the supplier to get quotes on battery backup for the server purchased because there is no power backup inside C111 and shifting the server to a different room may be time consuming at this stage, given that there should be additional permission taken by ICT to shift the server to a different room with power backup. Tahmina corrects Lohit on Robert's position as the Technical Services Manager.
- Ram suggests Lohit to check quality of data in the REAMIT cloud and push Whysor on this.
- Imke discussed with Ali about sending data to the cloud

**Action: Kate to forward this email to Lohit.**

- Ram says the big data server should be receiving data in the next one month. Data in specific formats should be received into the big data hub. Work with different data types.
- UU (William) working to sort out firmware compatibility issues with connectivity to reamit cloud. The documentation of the connectivity architecture is under progress and will be completed after having established a successful connection. Marcel promised William to setup the data connection to the cloud.

**Action: Lohit to see REAMIT cloud and see how much data is being currently received to the dashboard.**

**Action: Lohit to place a request seeking permission from ICT for hosting the cloud device.**

#### **WP T3**

No Update

#### **WP PM**

- Kate confirmed that REAMIT had a new officer at Interreg NWE Programme Joint Secretariat – Matthew Thompson as Una Bruhann left her role at JS at the end of September 2020.
- The team discussed involvement of Prof Jung (automotive engineer at BED with mechanical engineering background) in REAMIT team at BED bi-weekly meetings. Prof Jung would devote 5 % of his time (per moth) to REAMIT (as originally agreed with him in 2018). Ram said we could benefit from his industry experience and best practice examples.
- Ram asked from an update in the REAMIT risk log. Kate confirmed that eight risks were added to REAMIT Risk log during REAMIT online meetings in July. No new risks have been added since then.
- Kate said that REAMIT application form in eMS should be amended before the project extension could be granted. Kate confirmed that with the help of officers at JS, she completed amending REAMIT AF in eMS

and submitted it to JS for approval. Ram requested Kate to follow up about any documentation needed for the project extension. Tahmina said JS might offer project extension closer to the end of the project. Ram said it would be better if we had prior information about the project would be extended or not, at least 1-2 years before the project end date. If we knew there was going to be an extension, then the partners would need to contribute again 40% of the share to make the full budget during the extended period. Tahmina said that the RIVER project received extension based on the need for improving the engine machinery/equipment, and not completely based on COVID. The extension application demonstrated that significant results have been achieved so far.

**Action: Approach REAMIT partners and ask if they were ready to co-fund (at the rate of 40%) the extended period (12 months) of the REAMIT project. A formal approval from the Dean would need to be obtained. (Action for Kate and Ram)**

- Ram suggests Lohit to arrange separate meetings for discussing research progress and different ongoing research article activities.

#### **WP C**

- Sasha to finalize the newsletter soon.
- Sasha and Kate assist partners with developing REAMIT roll-ups (and replacing Dunbia with WD Meats logo).
- Ram: No need to include sub-partners on the website.
- Ram shares that his presentation at the Freshcift conference went well. Following are some questions raised:
  - What if the reduction in emissions through food waste is lesser than the increase in emissions due to digital technology implementation?
  - How much is the pay back time?
- It was concluded that the involvement of govt. funding is crucial for the success of these technologies in food sector.

#### **WP LT**

- Ram says translation could be arranged by the organising partner for the symposium which is going to be held in November, and he sees no reason of complicating the issue. In another conference attended by Ram they were translating manually from the other end in both ways. So, if the presentation time is for 40 mins, the content should be planned accordingly for 20 mins in one language. Tahmina says there should be automatic interpreter which can be purchased or availed as there are such services also available in the market.
- Ram: Deadline for the capitalization call is 10 January 2021. Bid for capitalization project will need to be created. We may have to reach additional partners, additional areas of supply chains and wait for calls, identify synergies over this project and other projects. Ram has in mind the following three companies to approach: Belgium partner, Work with Oost NL, Maastricht University.

**Action: Kate to circulate previous capitalization application.**

- Euro Green Deal: Two projects in each area are funded. Approx. 8 – 9 million for each call. To gain more information, we need to attend information evenings and talk about REAMIT, understand what they are looking for.

Yan: It is important to have very strong partners to convince the funders. From her past experience, she says that to have an UK organization in the consortium, there needs to be a strong reason. The option of leading the consortium may be seen as negative based on the above aspect. Ram agrees to Tahmina that funds would be coming from UK gov. and thus may not be significant reasons for not considering UK organizations, and also, acknowledging the point raised by Yan to give strong reason.



## Minutes of meeting, 09/10/2020 via Zoom within BED REAMIT Team

**(12: 00 noon – 13.00 PM)**

**Participants:** Lohithaksha M Maiyar, Katarzyna Pelc, Ram Ramanathan, Yanqing Duan

**Apologies:** Tahmina Ajmal

**On WP T1, Kate reported:**

- WD Meats will postpone dry aging trials after Christmas due to high demand during the period.
- James is under discussion with other biologist groups in Ireland to investigate on methods to detect Clostridium bacteria.
- For 3D fluorescence, Joan is discussing warranty issues etc. for getting sensors from Matthias.
- Whysor working on configuring the sensors for Picnic.

**Action: Kate will request Imke for an update on Picnic pilot.**

- WPT 1 monthly meetings to be started by Gael. Ram said there is need to chase UCD based on their response for the first meeting. Kate said they are finding it difficult to employee a person to work on their pilot.
- Yan shared her experience of a mini-case study with fresh sandwich supplier company.

**Action: Yan to refer back to her records and share the information of the fresh sandwich supplier company.**

- Yan shared her experience of a mini-case study with fresh sandwich supplier company.
- Ram shared he has meeting planned with Yumchop for offering a Visiting Consultant post in return for his contributions to facilitate for a REAMIT pilot test.
- Ram asked Kate to chase all partners to get more pilot tests where possible. He also felt that the project has funds for tests mainly with traditional sensors.

**Action: Kate to chase for more pilot tests.**

**On WP T2, Lohit reported:**

- An engineer from the supplier company visited on Monday (5/10) for hardware and software installation. Remote access was not setup because it needed further ICT permissions.
- Since the server needs two ports for configuring the remote desktop connection and the internet using 2 IP addresses respectively, purchase of 5 port switch (the minimum size available) for enabling multiple LAN connections is being planned (estimated cost GBP20-30).

**Action: Lohit will send email to partners Levstone, Whysor, BED, SenX and ITT for a meeting to be held in October on planning future steps and clarifying specific activities of different partners for WP T2.**

- The data on reamit cloud is the almost same as it was in March, except that there has been column for UU, but this does not show any data.

- Lohit sent email to Stevie, ICT, for approval for the purchase of WD 4TB cloud device. Lohit suggested if this is not approved, we could ask Sasha if it was possible to procure this and manage it from their University.

#### **On WP T3**

- Ram suggested Lohit to send an email to UCD for a meeting on WPT3.

**Action: Lohit will send out email to Shane and Fionnuala requesting their specific needs on data for WPT3 so that they can be requested from pilot leads likewise and deposited at BED server.**

#### **On WP PM**

Ram asked Kate to keep minutes/notes from all internal meetings in project handbook. This will not only include internal UoB meetings but also others such as the meetings with Sasha, William, and any internal meetings partners may have held in their group.

Kate reported following additional risks:

- Delay in recruiting employee by UCD
- Continued silence by UCD on progress on Irish pilot test.
- Delay by James to identify right method of Clostridium detection in WD Meats pilot.

**Action: Kate will send an email to ITT on an update on the person who was going to join.**

#### **On WP C**

- Kate reported that Sasha is finishing the 3<sup>rd</sup> video. Ram asked Kate to contact NTU to start preparing videos on pilot tests. This can be done, for example, by asking Whysor, UU, UoN for pictures and mini clips of ongoing pilots, which can then be edited as a 1-3-minute video to showcase progress. Other approaches like actual visit for preparing the videos can be considered where feasible. The communication team can decide plan whether to post 1 video per pilot or multiple pilots combined in one video based on material received.

**Action: Kate to contact NTU on the new video.**

#### **On WP LT**

**Action: All staff should register for the online symposium through email sent by Blandine.**

**Action: Kate will check the application for the status of deliverables of BED and other partners promised before December.**

#### **Research activity**

Lohit: No progress during last two weeks.

Ram suggested to conduct separate meeting only for research topics assuring that there is no pressure in hosting this. Lohit said this will interesting and he can present ideas and progress made so far as well as explore other ideas.

**Action: Lohit will send invite for research meeting in the coming week.**



## Minutes of meeting, 23/10/2020 via Zoom within BED REAMIT Team

(3:00 pm to 4:00 pm)

**Participants:** Lohithaksha M Maiyar, Katarzyna Pelc, Ram Ramanathan, Jun Peng, Tahmina Ajmal

**Apologies:** Yanqing Duan

1. REAMIT team welcomes Prof. Jun Peng to the internal meetings. Ram requested for his support in:
  - a. Overcoming challenges for making the Big data server hosted in IRAC accessible to outside partners.
  - b. Providing comments or feedback on reports/other documentation pertaining to REAMIT.
  - c. Exploring capitalisation proposals
2. Kate reported:
  - a. Michael (Yumchop) has not responded on identification documentation requests. Ram suggested to approach him for arranging a visit to his plant in Towester first. Paul from CST can be approached if he is interested to carryforward the block chain application.  
**Action: Lohit/Kate to send an email to Michael requesting to arrange a visit.**  
**Action: Kate to send an email to Michael on the scope of using liquid bacteria detection technology in vending machines.**  
**Action: Kate to forward the application sent by Yumchop to Ram.**
  - b. She needs training support to understand financial workflow and Agresso processing. Lohit offers to join the trial and error session.  
**Action: Kate to do trial and error in uploading the big data hub invoices and receipt them on Agresso. If unsuccessful, Kate will approach Carol/Khalid for correct approach.**
  - c. Sasha intends to upload the REAMIT roll-ups on the website. Ram agreed to this.  
**Action: Kate to send reminder email to partners who have not printed the banners in front of their offices etc: Levstone, SenX, UoN.**
3. Ram advised there is no need to worry about reporting on WP T3. We can mention that since there is not enough progress in WP T1 and WP T2, WP T3 has not started yet.
4. Ram advised that for the capitalization meeting all partners can be invited and brainstorm ideas.  
**Action: Kate to invite all partners and request them to submit a preliminary thinking for better use of time before the meeting.**
5. Tahmina and Ram presented the idea of collaborating with Seed to Farm project lead Dr. Onur Gumus (an acquaintance from the Green Deal networking event) by combining our expertise and extend their approach to a systems perspective across the whole supply chain of operations.
6. Ram presented another proposal to which he was approached by UCD on extending bio-farms innovations to supply chains.



## Minutes of meeting, 09/11/2020 via zoom within BED REAMIT Team

(2:00 pm to 3:00 pm)

**Participants:** Lohithaksha M Maiyar, Katarzyna Pelc, Ram Ramanathan, Jun Peng, Tahmina Ajmal, Yanqing Duan

1. On WP T1 Kate reported,
  - a. UCD – No further update other than the presentation made by Shane on Cyberbar. They need to be chased for ensuring the pilot aligns with REAMIT structure of pilots.
  - b. UoN- No further update
  - c. Whysor – No further update on German and Dutch pilots
  - d. UU – Dry aging: WD meats unable to start pilot test before Christmas. Ram is happy to wait for the company to respond.
  - e. UU – Clostridium: A student being trained to conduct swabs and laboratory testing. William and James discussing with Maastricht Uni about using liquid detection technique.
  - f. UU – 3D Fluorescence: Fresh detect sensors shipped back to Matthias. William is currently exploring alternative options with Whysor to overcome battery transport issues through air carrier. Tahmina suggests two options if it is possible to ship the equipment without battery:
    1. Using some sort of an adaptor
    2. Purchase the battery locally. If necessary, Ram proposes to have a meeting with Matthias, and William to discuss alternatives.
  - g. Yumchop has invited BED to visit the company but due to COVID regulations, BED staff unable to visit.
  - h. As a follow up of the REAMIT Symposium in Nantes, on Monday, 9 September Kate scheduled B2B meetings with Stephanie Guillotin from Biotech Santé Bretagne, which runs and coordinates Biotechnology (Capbiotek) and Health regional sectors. Kate will discuss possibilities for recruiting French companies for REAMIT pilot tests.

2. On WP T2,
  - a. No further update -- Lohit waiting to order and receive the switch and cables. Ram highlights to prioritize enabling access to outside parties.

**Action: Lohit to explore alternative temporary options with ICT to store and send data to analytics partners citing examples from NTU.**

**Action: Lohit and Kate to meet for raising the PO for the purchase of switch and cables. If unsuccessful, Kate to approach Carol/Khalid/Claire for further support.**

3. On WP T3,
  - a. Lohit reported UCD yet to fill the doodle poll for the meeting planned between UCD and BED to understand data requirements for LCA.

**Action: Kate to request UU (WPT3 lead) to plan for a talk on Technology readiness levels or Market readiness levels as per the requirement of WPT3 deliverables to help gain a common understanding amongst REAMIT partners.**

4. On WP M,
  - a. Payment to partners not made.
  - b. UCD to host online meetings
  - c. No response from the JS re extension of the REAMIT project.

**Action: Kate to send an email to JS requesting for a response on extension request.**

5. On WP C,
  - a. No update from Sasha as she was sick and could not attend the last sub-group meeting.
6. On WP LT,

**Action: Kate to request Sasha/Usha to request detailed feedback on symposium from Blandine through online questionnaire etc.**

**Action: Ram to send an initial thought on capitalization proposal in next few weeks.**

## Minutes of meeting, 11/12/2020 via Zoom within BED REAMIT Team

**(3:00 pm to 4:00 pm) Participants: Lohithaksha M Maiyar, Katarzyna Pelc, Ram Ramanathan, Tahmina Ajmal, Yanqing Duan, Khaqan Rana**

WP T1

**Kate:**

- Assist Whysor with engaging Matthias from Fresh Detect in the 3D fluorescence pilot test

WP T2

**Lohit:**

- Speak to Microsoft service provider and finalise external connector licensing for Big data server
- Speak to Levstone to help for performing external connector test.

WP T3

**Kate:**

- UCD sent a presentation describing their requirements on data for LCA approach while the meeting was being held.
- No response from UCD on virtual RSC meetings arrangement plans.

WP C

- No updates

WP M

**Kate:**

- To prepare excel table to be filled in by each partner with information on their budget in REAMIT extension project: budget per partner per WP, Budget Line, year.
- To organise a meeting with UCD (before Christmas) to discuss REAMIT online meetings in January 2021
- To ask partners how much money they have received in 3rd tranche from BED
- To prepare a contract for Lohit's support (RA)
- To update Risk log based on input from Imke on the German pilot test with Weyers (that lorry drivers do not agree to have gateway installed in the cabin)

To write BED progress report (July – December 2020) and send it for feedback to BED colleagues

WP LT



**Kate:**

- REAMIT Capitalisation call - prepare NDA for REAMIT, have it checked via BED legal team and send it to Yumchop
- Ask Whysor if they will visit Yumchop to install sensors
- Attend online meetings (as follow up of Food Waste Fest 2.020 event) to recruit a Belgian company for REAMIT Capitalisation proposal.

## Minutes of meeting, 16/02/2021 via Zoom within BED REAMIT Team (15.00 pm – 16.00 pm)

**Participants:** Lohithaksha M Maiyar, Katarzyna Pelc, Ram Ramanathan, Tahmina Ajmal, Yanqing Duan, Khaqan Rana, Joy Eze, Lakshmi Swamy

**Apologies:** Jun Peng

### WP T1

- Kate reported that no update from pilots in UCD, UoN, UU.
- Kate reported that German pilot company, Weyers pulled off. Ram suggested to keep exploring German partners while he agreed to Imke's proposal of looking for alternative pilot in Netherlands.
- Kate reported that a lady contact from the 2nd REAMIT symposium promised additional pilots in France.

### WP T2

- Lohit reported that Levstone is now able to connect to the server the database inside the server.
- Lohit reported that William has been able to connect the new sensor for dry aging trial to the whysor cloud and is waiting for a signal from WD Meats to visit and install at their site.
- Lohit reported that a meeting is arranged with Whysor to discuss initial data transfer architecture from Whysor cloud to Bedfordshire cloud. Ram suggested to check the application in terms of the deliverables promised to be addressed in WPT2.

### Action for Lohit:

- Speak to Microsoft service provider and finalise external connector licensing for Big data server
- Check the REAMIT application form for the progress under each deliverable of WP T2 and remaining ones to be addressed
- Ask William to send a document indicating the connection procedure he adopted for connecting the new sensors to Whysor cloud through the gate way.

### WPT3

- Ram suggested that William is not required to lead WP T3 meetings at the moment and can be thought about later.

### WP C

**Action:** Lohit and Lakshmi will meet to discuss the best way to modify the big data hub video with textual description.

### WP M

- Kate reported that extension of the project budget is submitted from some partners.
- UoN has claimed EUR 117000 in their last financial claims. And extension budget of EUR 53000, all attributed to high staff costs claims from their side.
- Ram suggested that Joy Eze, and Lakshmi be invited to attend WP T1, WP T2 and WP T3 meetings and the corresponding costs against the time spend can be claimed.
- Tahmina suggested that Gautam's time could be utilized to install some software for conducting analytics on the server.

**Action: Kate will forward the email she received regarding purchase of stationary items to all.**

Research progress:

- Lohit reported progress of 3 papers and 2 case studies
- Lakshmi reported that she is involved in developing 1 case study, big data hub video modification and preparation of a book chapter on "Use of AI technologies for reducing food waste"
- Ram suggested Lohit to organise at least 1 research meeting every month.
- Tahmina answered to Lakshmi's question on how calorie estimates are being measured that the data is received in the form of basic measurements from sensors such as temperature, humidity etc., while analytics helps to evaluate other dependent variables such as calorie, quality of fruits etc.

## Minutes of meeting, 15/03/2021 via Zoom within BED REAMIT Team (3 pm – 4 pm)

**Participants:** Lohithaksha M Maiyar, Katarzyna Pelc, Ram Ramanathan, Tahmina Ajmal, Yanqing Duan, Khaqan Rana, Joy Eze, Lakshmi Swamy

### WP T1

- The 20 sensors ordered for Picnic do not detect shock the way the company needs. The sensor can detect the most recent shock whereas the company needs the shock to be measure continuously. The sensor needs to be redesigned and firmware reprogrammed. Whysor is awaiting response from Elsys for their suggestions on new type of sensors that have continuous measurements. Ram suggested if needed Whysor can procure more sensors with funds from BED.
- No update on German pilot
- On the UU clostridium pilot, William reported that Clostridium bacteria available in the labs can be used.
- On the UU Dry aging pilot, sensors are connected and waiting for WD Meats to allow them to install the sensors on the site.
- 2 Masters students attended on behalf of UCD. Don't know about pilot test. Ram suggested no students should be attending work package meetings if they are not involved in any pilot tests.
- Gautam presented tables on data requirements.
- Ali has accepted to work with UCD. UCD needed data.

**Action: Lohit will send reminder to Christelle, Biogros.**

- Ram shared the discussion with VEC, a company contact made through Usha for REAMIT pilot test with brewery.
- Kate exploring operations with Unilever.

### WP T2

- Lohit reported that BED and Whysor are currently working to transfer data historically from Whysor cloud to Bedfordshire server.
- Ram suggested data backup schedule must be planned and find out data analytics partners access needs.

### WP T3

- No progress

### WP M

- Kate reported that ITT and UCD would not make a claim this time (4<sup>th</sup> claim)

- Extension budget discussed with Joan.
- Expected result of capitalisation call – End of April.

#### WP C

- Sasha is exploring the possibility of new website.
- Monthly meeting for WP C
- Sasha will be sending an email to partners about their obligation to communicate about REAMIT in local media, radios, and newspapers.

#### WP LT

- Kate reported that REAMIT will be presented at two online events: in March 2021 in Dubai; and in September 2021 in Brussels
- Extension budget discussed with Joan.

#### Research

**Action: Lohit to follow-up on research ethics applications.**

## Minutes of meeting, 4/05/2021 via Zoom within BED REAMIT Team (3 pm – 4 pm)

### **Attendees:**

Ram Ramanathan, Tahmina Ajmal, Lohithaksha Maiyar, Katarzyna Pelc, Lakshmi Swamy, Joy Ez

### **Apologies:**

Yanqing Duan

### **WP T1**

#### *Picnic*

- There has been no progress in the last month regarding getting the sensors to work correctly.
- Whysor are dependent on an update in the software of the sensor to be done by the manufacturer (ELSYS). Until now, that update has not been done.
- Whysor partners decided to go ahead with the current ELSYS sensor, and they will collect data on temperature and humidity and not on shock detection. In the future, they may consider purchasing a different sensor or ELSYS may update the software in the currently used sensor in Picnic so that the sensor collects correct information about shock.

#### *WD Meats (dry aging chamber)*

- Sensors have been configured and started to send data to dashboard. All works well but sensors are not installed in WD Meats but in William's home.
- WD Meats has not responded yet to William's emails regarding when they will open up and allow for installation of sensors.
- Actual installation of sensors at WD Meats factory should be simple.

#### *WD Meats (Clostridium Bacteria)*

- William still has not heard from UCD regarding the clostridium bacteria (CB), particularly whether UCD can send samples of CB to Ulster and whether CB is in good condition for analysis.
- William is going to look for CB from other suppliers. With a sample of CB, Ulster will be able to confirm the limit of detection of CB by the sensors.

#### *Routhiau (chicken) – UoN:*

- UoN are waiting for next step – transmission of data from Raman spectroscopy to BED server (activity on-going)

#### *IGRECA (Eggs) – UoN*

- UoN is carrying out new tests on eggs from IGRECA
- IGRECA is a French egg producing company located in western France (Pays de La Loire & Brittany)
- 1<sup>st</sup> approach: UoN received 4 kinds of samples from IGRECA (Egg powder)

- The aim of the tests is to evaluate the ability of the Raman spectroscopy to determine the chemical composition of the sample (for instance presence of salt)
- 1<sup>st</sup> report will be shared with Igreca; UoN are waiting for a new meeting with IGRECA in order to move forward with the potential pilot test with IGRECA
- Currently it is unclear what IGRECA will do with the obtained results from Raman measurements. UoN will meet with IGRECA to discuss it.
- The team welcomed the new pilot test but suggested that the common minimum requirements of all REAMIT pilot tests (e.g., measuring temperature, humidity, etc. and send the product on a truck) need to be followed.

#### *Yumchop (UK)*

- Whysor specified the equipment for the pilot test with Yumchop.
- BED is responsible for the procurement of equipment for Yumchop. BED has been collecting all paperwork necessary to obtain internal permissions for the purchase of equipment. Procurement at BED has recently requested procuring some pieces of equipment through AMEX. Kate is preparing paperwork related to purchase via AMEX.
- All equipment will be shipped to Whysor. Sensors will be configured by Whysor and Whysor will travel to install the sensors at Yumchop's food factory.

#### *Glen Affric Brewery, UK*

- NTU partners have recruited a new UK-based company for a pilot test in REAMIT. It is a brewery (beer manufacturer). First exploration meeting took place on 20 April 2021. NTU have sent a NDA to Glen Affric.

### **New pilot tests in the pipeline**

#### *Cash and Carry in NI (Mosgraves)*

- UU has met with a Cash and Carry group in NI, who are interested in participating in REAMIT pilot test. They confirmed they had food waste inside lorries, shops, distribution centre, so they did have many avenues to explore. They are open and seem interested to work with the REAMIT team. They say that meat products coming from suppliers already have been exposed to high temperatures. William thinks that 3D fluorescence sensors could be used to determine meat spoilage for this Cash and Carry company.

#### *BIOGROS, Luxembourg*

- On 4 May 2021, partners from Whysor travelled to Luxembourg to meet with BIOGROS company (a wholesaler of organic food) to discuss their involvement in a new pilot test.

#### *Unilever, UK*

- BED team approached UK based food producing company – Unilever (owners of food brands e.g. Knorr, Hellman's, Lipton, Carte d'Or, Pot Noodle, etc.), who are interested in developing a pilot test with REAMIT. First exploration meeting took place on 20 April 2021 attended by Ram, Kate, Yan and Unilever representative. Second meeting will take place at the end of May 2021.

MTU (Ireland)

- We need to ask Ger, Gautam and Pat to start working on a new pilot test in Ireland.

**Action for Kate: follow up with a Contact Point for Germany regarding recruiting new companies in Germany for pilot tests.**

**Action for Kate: follow up with companies from the Capitalisation proposal to engage them in developing new pilot tests.**

**Action: Kate to send an email (or arrange an online meeting with Gautam and Ger) regarding a new pilot test in Ireland (through Enterprise Ireland).**

## **WP T2**

**Action for Lohit: Organise a meeting with Levstone to discuss possibilities of creating a dashboard and summary of results on the mobile App.**

**Action for Lohit and Joy: Enable access to SenX.**

**Action for Lohit: Follow up server user access licensing.**

## **WP T3**

- Monthly meeting of WP T3 will be organised by William on 17 May 2021. Fionnuala from UCD has confirmed her attendance.

## **WP Management**

- Developing 12-months REAMIT project extension budget has been delayed as UCD have not sent their budget yet.
- Kate is collecting requests on letterhead paper from each partner to action transfer of payments from LP to PPs. This is a new requirement from finance at BED. Ram suggested that Kate asks this request immediately after partners submit their finance report in the next round.
- Kate has now received minutes from Gautam from RAC/WP/RSC meeting in January 2021.
- William Duffy from UU will be leaving REAMIT. His last day in REAMIT is 20 May 2021. A person to replace William has been appointed at Ulster and he will start the new role on 1 July. He will be Kate's contact for organisation of RAC/WP/RSC meeting on 7-8 July 2021, hosted by Ulster. William will nevertheless keep working for UU and will also from time to time help with REAMIT.

## **Actions for Kate:**

**To assist UCD and finalise developing 12-months REAMIT project extension budget.**

**To chase partners to send letterhead requests to LP to transfer funds to PPs.**

**To finalise minutes from RAC/WP/RSC meeting in January 2021.**

**To start arranging RAC/WP/RSC meeting on 7 – 8 July 2021, hosted by Ulster.**

**To agree with finance at BED calendar for 5<sup>th</sup> reporting round and send the reporting calendar to PPs.**



**WP Long Term**

No updates

**WP Communication**

- NTU will release April/May newsletter
- NTU are developing new videos. New videos on all pilot tests should be prepared. The videos can be strengthened further as and when more data are available after lockdown ends.
- NTU (Sasha) is developing Action Plan for communicating about REAMIT through local communication channels
- WP C online brief meeting will take place at the end of WP T1 meeting (on 17 May 2021)

**Research activities:**

**Action for Lohit: Discuss with Lakshmi on REAMIT research activities: (1) Book chapter, Picnic case study, Picnic poster.**

## Minutes of meeting, 1/06/2021 via Zoom within BED REAMIT Team (3 pm – 4 pm)

### Attendees:

Ram Ramanathan, Tahmina Ajmal, Yanqing Duan, Lohithaksha M Maiyar, Katarzyna Pelc, Joy Eze

### WP T1

#### *Picnic – NL*

- Whysor partners decided to go ahead with the current ELSYS sensor, and they will collect data on temperature and humidity and not on shock detection.
- In the future, they may consider purchasing a different sensor or ELSYS may update the software in the currently used sensor in Picnic so that the sensor collects correct information about shock.

#### *WD Meats (dry aging chamber) – UK*

- Sensors have been configured and started to send data to Whysor dashboard. All works well but sensors are not installed in WD Meats (but in William's home).
- WD Meats have not responded yet to UU's emails and the online meeting planned with UU last week has been cancelled. Ulster are concerned if WD Meats will remain in the pilot test.

**Action: Kate to check if WD Meats will remain in the pilot test or otherwise they need to exit the REAMIT partnership as a sub-partners of Ulster.**

#### *WD Meats (Clostridium Bacteria) – UK*

- UU have not made progress on purchasing clostridium bacteria from UCD as UCD still has not confirmed if bacteria was good enough to be sold.

#### *Routhiau (chicken) – UoN*

- No updates from UoN
- Ali did not attend WP T1 meeting on 17 May 2021

#### *IGRECA (Eggs) – UoN*

- No updates from UoN on this pilot test

#### *Yumchop – UK*

- Kate actioned purchase of equipment for Yumchop in mid-May.
- Imke from Whysor confirmed some equipment has been delivered to Whysor's address.

#### *Glen Affric Brewery – UK*

- Liverpool University has informed NTU and BED that the brewery needs to put on hold the work on the pilot test as they need to focus now on reopening of pubs and beer supply. They would return to the work on the pilot test in one month.

#### The Human Milk Foundation – UK

- First online meeting between BED and HMF took place on 21 May 2021. HMF confirmed they were very interested in participation in the REAMIT pilot test.
- Second online meeting with HMF and Whysor took place on 28 May 2021. It was agreed that Whysor would suggest which (of Whysor's) sensors would be shipped to HMF for the initial measurements, before BED purchased sensors for HMF; and HMF would identify two donors who agree to participate in the pilot test.

#### Unilever – UK

- BED team approached UK based food producing company – Unilever (owners of food brands e.g. Knorr, Hellman's, Lipton, Carte d'Or, Pot Noodle, etc.), who are interested in developing a pilot test with REAMIT. First exploration meeting took place on 20 April 2021 attended by Ram, Kate, Yan and Unilever representative. Unilever promised to respond whether they will participate in the pilot test, within one month.
- In mid-May, Unilever responded that they did not have so much fresh food waste during storage and transportation stages and therefore would not engage in the REAMIT pilot test.
- 'Everyone was very positive about the REAMIT project and think that the goals it sets out to achieve are very important. However, due to the nature of our products and materials we do not necessarily feel that Unilever is the best fit for you. We have very little fresh produce in our supply chain and so think the sensors you have won't provide you with useful data. We've identified that the main causes of waste are either due to in-factory processes – e.g. inefficient line transfers, cleaning, etc. – breakages, or in the consumer homes'.

#### **New pilot tests in the pipeline**

##### *Cash and Carry Group, Mosgraves, NI*

- Ulster have met with a Cash and Carry group in NI, who are interested in participating in REAMIT pilot test. They confirmed they had food waste inside lorries, shops, distribution centre, so they did have many avenues to explore. They are open and seem interested to work with the REAMIT team at Ulster. They say that meat products coming from suppliers already have been exposed to high temperatures. William thinks that 3D fluorescence sensors could be used to determine meat spoilage for this Cash and Carry company.
- James from Ulster confirmed, the company wanted to start the pilot test within the next 6 weeks.

##### *BIOGROS, Luxembourg*

- On 4 May 2021, partners from Whysor travelled to Luxembourg to meet with BIOGROS company (a wholesaler of organic food) to discuss their involvement in a new pilot test.
- It was agreed that Whysor would propose a solution to BIOGROS within 4 weeks.
- No new updates.

##### *MTU (Ireland)*

- Kate and Ram met online with Ger, Gautam and Pat to discuss a new pilot test in Ireland.

- It was agreed that within the next two weeks, Pat would look around for a suitable company, and let BED know the results.

**Action for Kate: follow up with companies from the Capitalisation proposal to engage them in developing new pilot tests.**

## **WP T2**

Previous Action for Lohit: Organise a meeting with Levstone to discuss possibilities of creating a dashboard and summary of results on the mobile App.

Status: Not started

Previous Action for Lohit and Joy: Enable access to SenX

Status: Completed, Provided University network access, created SQL instance for them and provided access to the same. Yet to receive confirmation on successful connection from SenX.

Previous Action for Lohit: Follow up server user access licensing.

Status: Ongoing, Received quotations. Delay due to person who is supposed to send the quotes from Softcat went on leave.

**Actions after this meeting:**

**Actions for Joy (Supervised by Lohit): Enable University network and SQL instance Access to Other 5 partners: UCD, NTU, UoN, I&R, and Valorial.**

**Actions for Lohit: Lohit needs further clarifications from Kate and Softcat on the quotes received. He will arrange meetings or discuss with them as appropriate.**

**Action for Lohit and Joy: Arrange a meeting with Wayne to discuss shared SQL instance creation on database server**

**Action for Lohit: Follow up with Tom on the progress with regards to UoN data conversion to blob file.**

**Action for Lohit: Organise a meeting with Levstone to discuss possibilities of creating a dashboard and summary of results on the mobile App.**

## **WP T3**

- Bi-monthly meeting of WP T3 was organised by William from Ulster on 17 May 2021.

## **WP Management**

- BED received feedback from the REAMIT officer at JS regarding 12-months REAMIT project extension budget. JS requested justification of costs, which are not staff and overheads costs.
- Payment from LP to PPs has not been done yet. Kate enquired about it several times, but things have not moved.
- BED prepared the agenda for the next RAC/WP/RSC meeting. NTU have sent out the agenda to partners.
- Calendar for 5<sup>th</sup> REAMIT report has been agreed with BED finance and FLC auditor and communicated to partners.

- Kate requested May timesheets from Joy and Lakshmi.
- Joy's VL contract needs to be prolonged.
- Kate shared concerns regarding communication with Levstone (do not respond to emails, delay REAMIT reporting).

**Actions for Kate:**

1. **To finalise work on 12-months REAMIT project extension budget.**
2. **To prepare a new VL contract for Joy.**
3. **To write BED activity report.**
4. **To write REAMIT project activity report.**
5. **To finalise minutes from RAC/WP/RSC meeting in January 2021.**
6. **To arrange online meeting with Levstone regarding communication and timely completion of Levstone's report.**

**WP Long Term:** No updates

**WP Communication**

- Sasha is concerned that partners do not agree to have their company name included in communication materials (posters, videos). Shall we go ahead with developing anonymised communication materials in this case?
- REAMIT officer at JS said that a separate website is not supported by the JS unless it has been included in the approved AF and can be justified. This is the case in REAMIT, so NTU are going ahead with purchasing a domain for REAMIT.

**Research activities:**

- Lohit, Ram and Lakshmi are preparing a book chapter on "Discovering potentials of Artificial Intelligence and Analytics in fighting against food waste".
- Lohit, Ram and Lakshmi have submitted an abstract to Logistics and Research Network 2021 conference.
- Lohit, and Ram have their presentation for the EurOMA conference in July 2021. Outcome from this research is also being presented at an invited lecture to a webinar series organised by Operations Research Society of India (ORSI).
- **Action for Lohit: Send email to all partners requesting for an update on their research activities**
- **Action for Lohit: Finalise ethical application for OR modelling research work, and sensor review work.**

## **Minutes of meeting, 14/10/2021 via Zoom within BED REAMIT Team (3 pm – 4 pm)**

**Attendees:**

Ram Ramanathan, Tahmina Ajmal, Yanqing Duan, Sahar Ahmadzadeh, Joy Eze, Katarzyna Pelc

## **Apologies**

Lakshmi Swamy

### **WP T1**

#### *Picnic – NL*

- Kate has contacted ELSYS, a supplier of sensors in Sweden, to procure 20 new sensors for the pilot test with Picnic. Finance at BED will not pay for the sensors until they have got an invoice from ELSYS. ELSYS will not issue an invoice until they have received the money from BED. Kate is trying to solve this issue.

#### *WD Meats (dry aging chamber) – UK*

- James from Ulster works with Marc on preparing the second trial in dry aging chamber before Christmas. Marc confirmed it will be second and last trial in dry aging chamber at WD Meats.

#### *WD Meats (Clostridium Bacteria) – UK*

- No progress.

#### *Routhiau (chicken) – UoN*

- No updates from UoN other than Prince de Bretagne confirmed they would not engage in REAMIT pilot tests.

#### *Yumchop – UK*

- Whysor visited Yumchop at the end of September and installed equipment at Yumchop's factory.
- Imke from Whysor offered to organise an online meeting in October to present Yumchop's dashboard.

#### *Glen Affric Brewery – UK*

- Whysor visited Glen Affric at the end of September to assess what sensors are needed for this pilot test. During the visit, Whysor installed a gateway at Glen Affric.
- NTU will purchase these sensors.

#### *Human Milk Foundation – UK*

- Whysor visited HMF at the end of September to fix problems with sensors. Marco from Whysor confirmed both sensors are now working well and sending lots of data to REAMIT cloud at Whysor. However, data shows room temperature, which means sensors mostly stay in a room and are not sent on trips.
- Kate contacted Natalie and Mike from HMF to ask if sensors were sent on trips, but there was no answer from HMF.

#### *Musgrave, UK*

- Marcel from Whysor advises James about what sensors should be used for this pilot test.

#### *BIOGROS, Luxembourg*

- No updates from Whysor.

### *3D Fluorescence*

- James from UU shipped a 3D Fluorescence Fresh Detect sensor to Tahmina Ajmal at BED. Tahmina will work with a Master's student at BED on experiments using this sensor. This will be completed by Christmas 2021. Then, the sensor can be shipped to Whysor.
- Tahmina's student will do literature review on detecting food spoilage. The Fresh Detect Sensor will be used to do some tests on fruits, vegetable and meat. The student will start experiments with 3D Fresh Detect sensor in the third week of October 2021. In November 2021, the student will present her work, so REAMIT team can contribute to the methodology and literature review. By end of December 2021, BED will be done with using this sensor and can ship it to Whysor.
- If Xavier from UCD and James from UU are interested to work with Tahmina on 3D Fluorescence sensor, he is more than welcome to contact Tahmina about it. However, they would first need to obtain consent from their line managers at UCD and UU.

**Action: Kate to inform Xavier from UCD and James from UU of the possibility to work with Tahmina.**

**Action: Kate to inform Whysor about Tahmina's work with 3D Fluorescence sensor and ask about Whysor's plan and calendar for work with this sensor.**

### *Blue Skies, UK*

- BED is waiting for Whysor to advise whether we shall go ahead with this pilot test or not.

**Action: Kate to chase Blue Skies to connect REAMIT with their logistics provider.**

### *Ernst & Young*

- Kate initiated contact with Gary Parker from E&Y whom she met at an online event 'Make UK: buyers meet suppliers' (5 October 2021), who supports UK companies in agri food supply chain access finance. Gary Parker offered to introduce REAMIT to companies in agri food supply chains to help recruit new pilot test partner companies in UK. Gary Parker agreed to meet online with Kate, Ram and Tahmina on 13 October 2021, however he did not show up at the online meeting at the agreed time.

### *MTU (Ireland)*

- No company has been recruited for pilot test in Ireland.

### *UCD*

- No company has been recruited for pilot test in Ireland.

## **WP T2**

Sahar has faced many challenges with accessing VPN from home. Hence, she was unable to connect to Big Data server. Joy worked with Sahar on solving this problem. David Sparkes (from ICT at BED) helped solve the VPN problem. Sahar is now able to connect to VPN and the Big Data server.

Sahar will now work on connectivity to Big Data Server, to ensure that all relevant partners are connected to the Big Data Server.

Sahar will work on adding an instance to the Big Data Server.

Sahar started to look at procuring a licence for the Big Data server.

**Action: Joy to share with Sahar emails and materials (from Lohit) related to connectivity and adding an instance.**

A visit to Big Data server at Luton campus in BED is planned on 20 October 2021 from 3 PM – 4 PM. All team members in REAMIT at BED are invited to join.

**Action: Kate to arrange this visit by contacting security and ICT at BED.**

WP T2 online meeting will take place on 22 October 2021. It will be facilitated and coordinated by Sahar.

**Action: Sahar to meet online with Kate to review actions from 16 September 2021 meeting of WP T2 as preparations for WP T2 meeting on 22 October 2021.**

**Action: Kate to review minutes from 16 September 2021 online meeting of WP T2 and send feedback to Sahar.**

On 11 October 2021 Sahar made a presentation of the REAMIT project to BED students.

Sahar expressed interest in working with Tahmina. Ram confirmed that Sahar's main priority is ensuring smooth implementation of WP T2. This involves managing the Big Data server and coordinating and leading on the work of data analytics partners in REAMIT. The REAMIT project offers a good opportunity to learn about data analytics, as we are placed in the middle of many businesses who will be sending lots of data to the Big Data server. This creates a great opportunity to learn.

Ram confirmed that while Sahar's first priority is to focus on WP T2, if time allows Sahar is encouraged to work with Tahmina as well.

### **WP T3**

- UU should involve a professor from Business School in the work on this WP.

**Action: Kate to send an email to Joan at Ulster to ask about Ulster's work on WP T3.**

- A meeting with the HMF on LCA at the end of August 2021: Natalie from the HMF confirmed they did LCA for HMF from their own perspective; however, the boundaries HMF has put in case of their first LCA were different, than they would be for LCA for REAMIT.
- LCA for REAMIT would look at the amount of energy that has gone into producing sensors used for HMF; this is because for REAMIT, the technology is the focus point; the boundaries are different.
- You can do LCA from different perspectives; REAMIT LCA of HMF is different than the LCA of HMF that HMF carried out before.

Ram suggested not to press HMF at the moment and wait for them to come back to us.

Ram confirmed it was fine to now approach Yumchop for LCA.



**Action: Kate to ask UCD to approach Yumchop for LCA.**

#### **WP Management**

- FLC audit of REAMIT project is delayed by FLC auditor at BED by at least 2 weeks.
- On 20 October 2021 Kate and Ram will meet online with Charmaine Guyo (finance) at BED to discuss how to avoid delays with transferring funds from LP to PP.
- Ram will start his new role at UEssex on 1 November 2021. Kate worked with Ram on involving University of Essex as sub-partner of BED in REAMIT. It is not sure if Ram will keep using his BED email address after he moves to University of Essex on 1 November 2021. Nick Lancaster from BED's Research and Innovation Service supported this idea. Ram asked the dean about it, and hopefully this will be possible. All REAMIT related communication needs to be sent to Ram's gmail address from 1 November 2021, and until he has his new email address established at UEssex.
- Ram's gmail address: [dr.ramanathan@gmail.com](mailto:dr.ramanathan@gmail.com)
- Yan will prepare Ram's VL contract at BED.
- Joy's 2 new VL contracts have been approved by Ram in vStaff.

**Action: Following Yan's input, Kate to enable the function in zoom enabling participants to enter the online room any time.**

#### **WP Long Term**

- 3<sup>rd</sup> REAMIT symposium will take place on 8 – 9 December 2021 in Dublin as a hybrid event (in Dublin physically and attendance online). Online registration will be opened soon, and partners are encouraged to attend this event physically where possible.
- Tahmina and Yan confirmed they would travel to Dublin to attend the REAMIT Symposium. They also confirmed they were available to chair round table discussions.

**Action: Kate to support Sahar with obtaining a visa for her trip to the REAMIT Symposium in Dublin.**

#### **WP Communication**

- Whysor confirmed that Picnic agrees to have its name used in REAMIT Communication material and channels.
- Sasha from NTU is working on REAMIT October 2021 Newsletter and contacting partners for inputs to the Newsletter.
- Usha is developing case studies based on REAMIT pilot tests.

**Next monthly meeting of REAMIT team at BED and UEssex will take place on 17 November 2021 at 10AM – 11AM.**

## Minutes of meeting, 17/11/2021 REAMIT team at BED and UEssex monthly meeting

### Attendees:

Ram Ramanathan (RR), Yanqing Duan (YD), Tahmina Ajmal (TA), Sahar Ahmadzadeh (SA), Joy Eze (JE), Katarzyna Pelc (KP)

Guest: Jipsy Sudharsanan Vinu Padman (JP), TA's student

### Absent:

Lakshmi Swamy

### WP T1

Running pilot tests:

1. Picnic, The NL
2. Biogros, LU
3. VHG, The NL
4. Yumchop, UK
5. HMF, UK
6. Glen Affric, UK
7. WD Meats, Dry Aging Chamber, UK
8. WD Meats, Clostridium Bacteria, UK
9. Raman Spectroscopy, FR
10. New pilot test company in Germany (fresh food supplier) recently recruited by Whysor

Other pilot tests:

11. FreshDetect sensors – TA's student has done some experiments
12. CyberBar, UCD, may not be the pilot test any longer
13. Freshbox prototype, UCD, no progress from UCD
14. Blue Skies, UK – no news from them
15. I&R and Valorial – no news about new pilot tests in France
16. Kate contacted again Gary Parker (E&Y) asking for an online meeting to help recruit agri-food companies in UK for REAMIT pilot tests but had no response from him

KP advised that Ali Assaf does not attend WP T1 monthly meetings.

### Action: RR to send an email about it to partners at UoN.

Research associates at UCD and MTU seem not to get support from their more senior colleagues and seem to be left alone in their work on the REAMIT project. This maybe causing frustration. RR suggested organising two online meetings – one with UCD team and one with MTU team to address this issue and find a solution. If the research associates at UCD and MTU do not get support from their more senior colleagues, BED would like to take a lead and guide the research associates at UCD and MTU in their work in the REAMIT project.

**Action: Kate to arrange online meetings with teams at UCD and MTU to address the need for better support for research associated at UCD and MTU.**

RR suggested that we need to set time when to say no to new pilot tests. We will continue recruiting new pilot test companies for a few more months.

YD suggested developing an overview table for all REAMIT pilot tests. It should provide information:

- who is responsible for the pilot test
- status of implementation
- risks
- which parameters are measured
- which sensors are used
- etc.

**Action: Kate to develop the overview table of all REAMIT pilot tests.**

## **WP T2**

JE summarised what the problem is with the Big Data server at BED:

- We tried to update MSQL and once this was done, we have not been able to access MSQL server.
- The product that has been updated is not the same as the old one.
- One of the solutions could be to go to the original file and bring the old one. We cannot access the old file/parent folder. Gautam has been involved in solving this problem, but he has not been successful.
- Emails of Lohit and Ram in the Big Data Server are not active. We need to update these email addresses.
- Joy and Sahar to become administrators of the Big Data server.
- Joy and Sahar will look at SharePoint to review what information Lohit has left there regarding the Big Data Server.
- Admin for Microsoft product vs admin of the Big Data Server => these are 2 different functions

SA summarised the work she has done in the past month:

- Developed introduction to the Big Data server user manual
- Carried out data analysis of data obtained from Picnic; Sahar used MatLAB for analysing this data; generated graphs and will explain it on 23 November at WP T2 meeting
- Will look at data from HMF (graphs and analysis)
- Will formulate justification related to the purchase order of a licence for Big Data Server (limited and unlimited access)
- Confirmed that data was not coming to the server as the server was frozen.
- Sahar would report per action at WP T2 meeting.

RR advised that SA, as the lead of WP T2, needed to be more proactive. If the Big Data server does not work, analytics partners will do nothing and will not make any efforts to analyse data. SA needs to make sure analytics partners get the data even if the Big Data server currently does not work.

**Action: Sahar to push Imke (Whysor) to send data well ahead of WP T2 meeting to analytics partners.**

- SA cannot let data analytics partners say, that since they had no data, they could not do data analytics for the next WP T2 meeting.

**Action: SA to make sure that data that have been generated by REAMIT pilot tests has reached business analytics partners ahead of WP T2 meeting in December.**

**Jipsy Sudharsanan Vinu Padman's (JS) presentation**

- JS is a student of Dr Tahmina Ajmal.
- JS is developing MSC project
- She did literature review which covers different sensors, classification of food sensors
- FreshDetect sensors
  - o Microbiological account on raw food
  - o It calculates the total count of bacteria – it has software modules built in

RR thanked JS for this good work and Tahmina for encouraging it.

TA: It is important to compare JS's work with what is in the literature.

RR asked if there were any research studies using freshdetect sensor?

JS said 'No'.

RR: It may be a good idea to check with Mathias Heiden these results.

TA advised that the next step is to have a meeting with Mathias to discuss JS's findings. Jipsy is looking at existing work on using 3D Fluorescence sensors on fruit and meat; only when bacteria grow.

TA suggested the steps in the work with FreshDetect sensors:

- Purchasing / borrowing another 3D FreshDetect device. Comparing FreshDetect sensor with other sensors may be helpful. TA asked if we can rent a second sensor.
- We discussed employing Matthias as an external consultant in REAMIT. Ulster have been assigned funds for working with 3D Fluorescence sensors (i.e. FreshDetect sensors) so they should be responsible for offering a consultant contract to Matthias. Ulster have received about EUR 95k for FreshDetect work. It will be beneficial if Xavier, Imke and BED work together with Ulster on the use of FreshDetect sensors.

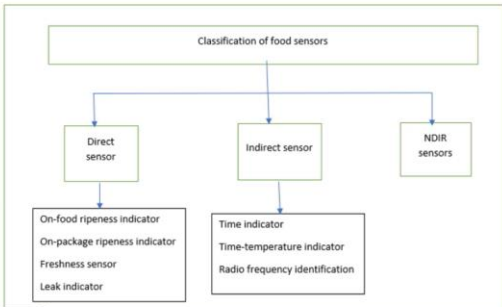
**Action: Kate to explore with UU, Whysor and UCD possibilities for working together on FreshDetect sensors and involving Matthias Heiden.**

REAMIT team at BED and UEssex monthly meeting, 10.00 - 11.00

49:21

Request control

## Introduction



```

graph TD
    A[Classification of food sensors] --> B[Direct sensor]
    A --> C[Indirect sensor]
    A --> D[NDIR sensors]
    B --> B1[On-foed ripeness indicator]
    B --> B2[On-package ripeness indicator]
    B --> B3[Freshness sensor]
    B --> B4[Leak indicator]
    C --> C1[Time indicator]
    C --> C2[Time-temperature indicator]
    C --> C3[Radio frequency identification]
  
```

Trade Name	Company	Type
RipeSense®	RipeSense™ and ort Research	Ripeness indicator
FreshTag®	COX Technologies	Freshness indicator
SensorQ®	DSM NV and Food Quality Sensor International	Freshness indicator
Novas®	Insignia Technologies Ltd.	Integrity indicator
Ageless Eye®	Mitsubishi Gas Chemical Inc.	Integrity indicator
TimeStrip®	Timestrip Ltd.	Integrity indicator
Novas®	Insignia Technologies Ltd.	Integrity indicator
Best-by™	FreshPoint Labs	Integrity indicator
Smartlid	Smart Lid Systems	Temperature indicator
TimeStrip® PLUS Duo	Timestrip UK Ltd.	Temperature indicator
Thermochromic ink	Tetrapak Ltd.	Temperature indicator
TimeStrip Complete®	Timestrip UK Ltd.	Time-temperature indicators
MonitorMark™	3M™, Momensta	Time-temperature indicators
Fresh-Check®	Temptime Corp	Time-temperature indicators
Onvu™	Ciba Specialty Chemicals and Freshpoint	Time-temperature indicators
Checkpoint®	Vinab	Time-temperature indicators
Cook-Chex	Pymab Corp	Time-temperature indicators
Color-Therm	Color-Therm	Time-temperature indicators
Thermamax	Thermographic Measurements Ltd.	Time-temperature indicators
Easy2log®	CAEN RFID Srl	RFID
Intelligent Box	Mondi Plc	RFID
CS8304	Convergence Systems Ltd.	RFID
Temptrip	Temptrip LLC	RFID

Commercially available on package sensors

Unmute (Ctrl+Shift+M)

Jipsy (Guest)

10:50 17/11/2021

REAMIT team at BED and UEssex monthly meeting, 10.00 - 11.00

51:48

Request control

## Freshdetect

- ❑ Freshdetect is a handheld optical device which can be used to determine the surface microbial count on raw food.
- ❑ Freshdetect uses wavelength of 405 nm as a source and collects fluorescence spectrum from the surface .
- ❑ Freshdetect device calculates the TVC (total viable count) using a stored algorithms. This is developed using following steps
  - Data collection of "sufficiently many" reference data
  - Correlation of data with classical petri dish and laboratory tests. Algorithms are trained with reference data (only part of data)

### Experiments Conducted

- Test on minced Turkey breast: The sample stored in fridge for 2 days.
- Test on chicken breast: The sample stored in fridge for 5 days.
- Test on strawberries: The samples stored in fridge for 5 days.
- Test on strawberries: The samples stored at room temperature for 3 days.

Jipsy (Guest)

10:52 17/11/2021

REAMIT team at BED and UEssex monthly meeting, 10.00 - 11.00

01:04:09 Request control

## Conclusion

- Analysis of TVC from chicken breast showed varying results on each day. After deterioration TVC showed very high values i.e.  $>1.0 \times 10^8$  cfu/cm<sup>2</sup>.
- Analysis of fluorescence spectrum from chicken breast showed a higher value for deteriorated sample when compared to fresh sample.
- Analysis of fluorescence spectrum from strawberries (stored in fridge) showed a smaller peak and a shift in deteriorated sample on day 5 when compared to fresh sample on day 1.
- Analysis of fluorescence spectrum from strawberries (stored in room temperature) showed a variation on the pattern for the sample (S1) that deteriorated faster when compared to the other sample.

James Gillespie  
 Re: WP T3 meeting  
 CAUTION: This email originated from outside of the University of Bedfordshire. Do not click links or open attachments.

11:04  
 17/11/2021

## Minutes of meeting, 16/02/2022 REAMIT team at BED and UEssex monthly meeting

### Attendees:

Ramanathan Ramakrishnan, Yanqing Duan, Tahmina Ajmal, Sahar Ahmadzadeh, Joy Eze, Lakshmi Swamy, Katarzyna Pelc.

### WP T1

- KP: A visit to HMF is being arranged to be attended by James and Sahar (installation of sensors: temperature, humidity and binary), Tamiris (LCA), Sasha (videos). KP and RR are keen to attend too.
- TA is keen to keep one of Davinder's Blue Maestro sensors to do some tests and comparative analysis with the sensors suggested by James. TA is also keen to purchase sensors. TA thinks this may provide data for a good publication. These will be IOT sensors (temperature, humidity). **Action: SA to action the purchase of sensors suggested by TA. If needed, KP to brief SA about the procurement process at BED.** RR said this was one of his motivations to start writing the sensor review paper and trying to look at different criteria and aspects of sensors. REAMIT set-up account can be used to purchase a few relatively cheap sensors for comparison. The sensors will be purchased from UK suppliers, which should make the procurement process easier.

### WP T2

Server connectivity:

- SA: All analytics PPs confirmed they could connect to the Big Data server.

Transferring data from the Whysor cloud to the BED server:

- James, Gautam, Joy and Sahar jointly wrote a script for automatic transfer of data from Whysor cloud to BED Big Data server.
- There are some updated values for data available for each pilot test.
- SA confirmed that data in the Big Data server is now live. It is not being pushed any more by Whysor, but it flows automatically.
- RR thanked SA and JE for the big work on making the necessary arrangements to push data automatically from Whysor cloud to Big Data server. This was a true multidisciplinary effort.
- JE: Data in the REAMIT server at the moment is coming from Whysor's cloud. Data is sent to the REAMIT-Whysor dashboard in the Big Data server and get updated automatically in the shared instance. BED do not have the rights to pull data from Whysor's cloud. Whysor were supposed to write a script to automate this process but have not done so at the time of this report. We don't have the access right here and we haven't worked on that because it's Whysor's responsibility to transmit data. Last week JE, SA, JG and GS wrote a script that would automatically update data in the shared instance, where everyone has the access rights. As soon as new data is deposited in Whysor's database inside REAMIT server, it automatically goes into the shared instance. Previously we had a manual way of pushing data to the shared instance which caused many analytic partners to lose their view to database as it gets deleted and replaced over and again. But now, the TRIGGER statement



allows events such as INSERT, DELETE, or UPDATE to occur against a table automatically in the shared instance whenever such action happens on REAMIT-Whysors' database.

- RR: It is fine if data still rests with Whysor, as long as REAMIT has a copy of it and is able to pull data in real time for data analytics.
- JE asked about meta data and the documentation requirements for each pilot test. RR confirmed that each pilot test lead should be involved in this work on meta data for each pilot test.

Pilot test leads:

Yumchop – Kate

WD Meats – James

Musgrave – James

HMF – Kate

Blue Skies – Sahar

Picnic – Whysor

Raman Spectroscopy – Ali / Omar

BIOGROS – Imke

Glen Affric – Sasha and Usha

User manual:

- SA has written some chapters and will send it to JE for input.

Next WP T2 monthly meeting:

- **Action: SA to arrange the next meeting of WP T2.**
- **Action: SA to prepare some data analysis of the latest data for presentation at WP T2. SA to send this analysis to RR for feedback before this is presented at WP T2 meeting. RR would give some suggestions for improvements to SA.**

Meeting with Yumchop on data analysis:

- **ACTION: SA to send a doodle pool to the data analytics partners to arrange a meeting on data analytics before having a meeting with Yumchop.**

### WP T3

- RR confirmed WT3 meeting has just been held and it appears that the work under WP T3 has started moving. There are four activities in WP T3 and all have progressed. Professor Elaine Ramsey (ER) from the Business School at Ulster University attended WP T3 meeting. RR asked her to be part of future WP T3 meetings, and she agreed. She talked about research studies on REAMIT pilot test companies, which she calls case studies. However, they will be different to the case studies developed by Usha and researchers. Their case studies are in the report format, which is meant for classroom use, not research publications. Though research publications can come out of it. Whereas Elaine talks about



research publication based upon rigorous application of qualitative research methodology. RR asked ER to be in touch with us and Yan in particular, who is leading some research studies already.

- Tamiris will visit Yumchop soon to collect data for LCA. She will combine it with visiting BED to collect data about the Big Data server (e.g. energy consumption). RR requested Sahar and Joy to arrange a visit into the Big Data server room to help Tamiris collect information that she needs. TA said that such visit would not be possible as the Big Data server is kept in highly secured area. Partners were asked to share with Tamiris data (voltage, power) and materials (photos) about Big Data server. Once Tamiris comes to Luton, a meeting or working lunch will be arranged. Tamiris will be invited to give a presentation of her work at seminars at IRAC and UBBS (given her work on LCA is related to other business economics).
- **Action: JY and SA to share with Tamiris photos and videos of the Big Data server and the server room.**
- Tamiris' visit at BED and Yumchop will be combined with visiting HMF to approach Natalie Shenker again about LCA for HMF.

#### **WP Management**

- KP: PPs work on finalizing progress reports 3.2. KP works on 2 reports 3.2: project progress report and BED progress report. For BED report, KP needs input and guidance from Finance on the methodology for calculating staff costs at BED. It is a new task that Kate was asked to do by Finance.
- KP works in parallel with FLC auditor on finalising REAMIT project progress report 3.3, which is special report with claims from Whysor, NTU and UCD.
- On 15/02/2022 KP met with JE and SA at Luton campus (had working lunch) to discuss REAMIT updates; and went to collect some stationary from UBBS for JE, SA and KP.
- KP was waiting to hear from JS about the REAMIT extension budget.

#### **WP Long term**

No updates.

#### **WP Communication**

- RR: Communication team is now trying to produce a new newsletter and we should start thinking about news articles that can be included in it.
- KP: Sasha will join a visit at HMF to take footage for a video on HMF.
- KP: James from Ulster arranged a meeting with video producing company who will work with NTU on a documentary video about REAMIT. NTU are keen to have a video product produced by the professional company. Video company needs to make a quote. This video will show achievements of the REAMIT project. Production of this video will finish next year.
- KP asked for ideas how to use the new REAMIT website in more meaningful ways. For example: adding an option in the new website for partners to log in to MSSQL server or at least give some instructions.  
**Action: All to look at the new website and suggest ways to improve it.**
- KP is still waiting for the notes from RAC/WP/RSC meeting in January 2022.
- KP will prepare a new VL contract for JE.

## Minutes of meeting, 22/03/2022, REAMIT team at BED and UEssex monthly meeting

Attendees: Ram Ramanathan, Yanqing Duan, Tahmina Ajmal, Sahar Ahmadzadeh, Joy Eze, Katarzyna Pelc.

### WP T2

- Licences for Big Data server. RR: we don't need to purchase extra licenses unless we have reached more than 50 users.
- Data analytics: SA improved graphs and used Python to draw other graphs. She has not found anything useful in the data.
- **Action: Sahar, on regular basis, to chase analytics partners for updates on data analysis.**
- JE: James from Ulster asked that 3 of his data analysis colleagues (Brian, Daniel, Pushparaj) are added to the Big Data server database. RR said it was fine as long as they are part of the REAMIT team at Ulster. Data from REAMIT pilot tests must not go beyond the REAMIT team. So in case of doubt, please consult us before giving access to Big Data server to any new people.
- **Action: JE to created access to the database for 3 persons from Ulster.**
- JE: Uploading data in Big Data server is very slow.
- JE: we have data coming from Yumchop, WD Meats, HMF.
- RR: since there are three more people at Ulster looking at the data in addition to James, they should give us some feedback on the data quality, data content and then analytics results that they find. Only those that are motivated will be able to find something very useful in the data from pilot tests. We can encourage Ulster to do data analytics but at the same time we should not push them. If they are willing to do data analytics, that is very fine. **Action: SA to chase them for this.**
- JE: We haven't used up our space even up to 10% in the Big Data server. RR suggested interacting with Davinder to make sure that the default is available for us continuously without interruption. Otherwise, if we need to buy some licenses, we should buy them.
- YD: A slow database is because of how it has been designed? Who designed the database or is it set as default? JE explained that the design was there, but we can specify how we want it to work. It was designed by Whysor. They shared instance that we are using. It is like a table with specification of what it can accept and what it can reject. It was done by the company who are supposed to be looking into any of these serious issues. Our role is to report to them and they shall guide us on what to do because we're just administrators not technical people. They can design another table which may be able to accommodate bigger data coming in, but the whole setting would be able to accept it. We need a way of optimizing it to work faster.
- TA: Is there a plan for the data to come directly into the big data server? RR: That is the original idea, but because we had so much of delay in procuring the Big Data server, Whysor decided that we use their own server and then now it is pushing the data into REAMIT server. I don't want to disturb that setting at this moment because it works well, and our system at BED is somewhat unreliable. Whysor's server works well and they have good technical hands to help us, so it's better to have them involved. It is like the parallel system. That is why I didn't want to insist that we don't need Whysor cloud anymore because they're also our partners and in fact they are installing sensors so that the

data come to them first before coming to us. So, I don't find any difficulty. I don't want to press that data is coming only to the REAMIT server. The architecture of the Big Data server is the one that Whysor has designed, so it's very difficult for us to resolve that problem. Whysor can give access to everyone and circumvent our REAMIT server completely, which is not a good thing because we have invested so much in Big Data server. If this delay in data synchronisation continues, we can consider directly approaching Whysor about it. Whysor said it's easy for them to give instances to all of us, and I think they are technically more capable than us. They are technicians and we are researchers.

#### WP T3

- In February 2022, we had a WP T3 meeting. Professor Elaine Ramsley from the Business School at Ulster is interested in developing case studies based on pilot tests and she is keen to participate in monthly meetings of WP T3. Usha is working on case studies with researchers and Prof Ramsley is aware of this work. Her case studies will be very different because she would be using qualitative methodology.
- James is organizing a qualitative questionnaire survey meeting.
- Qualitative case study involves going and interviewing people in pilot test companies, getting their opinions and creating a framework based upon the combined knowledge. Whereas Usha's case studies are more describing.
- YD: we will have the meeting, which we can call a research meeting, focusing on creating research output, not a case study for teaching or reporting purposes.
- RR advised Tamiris to go and visit pilot test promises for LCA data without any further delays.

#### WP Management

- REAMIT special report 3.3 including Whysor, NTU and UCD's claims was processed yesterday by JS. We are now expecting the money at UoB which will be transferred to partners.
- KP finalized the finance part of UoB report 3.2. Michael from finance asked Kate to liaise with the auditor to manage the audit at BED and complete the audit.
- 12-months and budget extension of the REAMIT project was formally confirmed on 25 February 2022. KP is updating the REAMIT AF in eMS. KP will discuss with Peter at JS some elements of the updates.
- KP works on VL contract for Elias Eze.
- UoN have asked about moving funds between budget lines (EUR 30,000). KP will contact Peter at JS to get his permission.
- UoB have been invited to Trace and Track network meeting on 30 March 2022.
- KP did not receive minutes from the REAMIT Steering Committee meeting in January 2022 due to delays from different partners.
- KP will work with finance to extend contract with auditors from Mazars.
- RR would update eMS with information about University of Essex.
- RAC/WP/RSC meeting in July 2022 will be hosted by Whysor in the NL. Kate asked Imke to send a proposal for possible locations, accessibility by plane/train and a plan for visits to pilot test companies.

#### WP Long Term

- The 4<sup>th</sup> REAMIT symposium – no activity yet.

#### WP Communication

- The newsletter is almost ready, waiting for Gautam's input.
- Sasha was asked to do updates on both websites. At REAMIT sub-group meeting we are discussing how to improve the website because they are very little populated especially the new website.
- Sasha is working on the new video with the professional company suggested by Ulster. RR said it was a good development because we need to showcase REAMIT at the end of the project.
- TA: shall we invite people from Luton Borough Council and Pat Burrow council to attend RSC meeting in July 2022? RR: yes, we can ask them to make a presentation about their activities in terms of food waste management (15 minutes presentation at our RSC meeting). Obviously, they may not want to come to the RSC meeting in person. In this case, they can do it via zoom. In this way, we can give them opportunity to present to a multinational consortium. As in case of Bedford Council, we can promote through them the idea of minimizing food waste through the use of technology. We may also ask, what sort of help they want from us, we can engage in a dialogue and discuss how we can work with them, in supporting them in their activities. I'm sure that they are interested in reducing food waste and we have some opportunity to help them and we can work with them as to how we can do it. TA: maybe we can make a presentation to them in some form. RR: yes, you can. TA: at the start, maybe they can just visit our website.
- **Action: TA to contact Luton Borough council and invite them to RAC/WP/RSC meeting in July 2022.**
- RR is currently working with Colchester Borough Council (University of Essex has main campus in Colchester whereas South and has a very small satellite campus).

## Annex 3. Notes from meetings of REAMIT sub-group

## REAMIT sub-group meeting, 9/06/2020

Attendees: Kate (UOB) , Sasha (NTU), Lohit (UU) , William (UU)

### **3<sup>rd</sup> reporting period – Progress report**

Kate states that this progress report will be about the expected delays. Feedback requested for the content on the meeting.

Input from partners, how COVID-19 impacts this. We will be requesting a financial extension as well as time extension on the project.

Partners have advised 4-6-month delay with pilot testing, although Whysor and their associated pilot test partner Picnic is ready to go ahead with their pilot test.

### **RAC RSC Meeting in July**

RAC/WP/RSC meeting agenda is being developed. Requesting feedback to finalise agenda and discuss the two-day meeting, duration etc.

Addressing and assessing new risks posed with covid19, addressing delays with pilot test. Some sessions might be shorter. We aim for a high-quality meeting with participation from all partners.

Most of the meeting will be spent discussing/focusing WPT1 due to delays with pilot testing.

Lohit mentioned the platform that will be used for the meeting, Sasha's suggestion was Microsoft teams would be suitable for large group meetings.

Lohit suggests having input from tech companies on pilot testing technology or just some insight in the afternoon of the RAC. William will get in touch with WD Meats, as associated partners to participate in the meeting.

Sasha mentioned the WP C in the meeting, how this has been impacted by Covid-19, due to the lack of activity.

Kate went through the points to be discussed in the WP meetings. Discussed the duration of each WP discussion, but has requested feedback on the draft meeting agenda, which will be sent to us tomorrow (Wednesday). KP requesting for Sasha to think about the WP C communication presentation, how much time we'll need and points to discuss.

William shared with us a presentation prepared about the pilot testing with WD Meats which is still going ahead, research is being carried out. Discussing 'clostridium esters' and its effects of factors such as bugs on the meat, resulting in large quantities on food waste. Currently sourcing sensors and will get this experiment running soon.

Lohit mentioned discussing with Whysor and Levstone, to discuss their opinion on the draft questions to collect, for sourcing appropriate sensors. William will also be involved in this. On Monday, they will discuss with Whysor about the sensor paper being developed. Will discuss the outcome in the July meeting.

### **Big Data Hub**

Started on looking supplier for the data server.

Budget on £8k. Looking to source good processor, compatible and large enough for the project. They have found a second supplier who is able to provide the same service for a more reasonable price, now waiting for 3<sup>rd</sup> supplier. Lohit discussed further server options with Kate. Difficulty: purchasing this equipment now will mean difficulties installing in the university as the building is closed.

### **June Newsletter**

Ask the question – how partners think they will recover from lockdown. Highlight the progress made by some partners in pilot test. Use information from the report Kate has provided. E.g positive aspect – pilot test progressing with Whysor.

Lohit & Kate provided advice on the Covid-19 report written by Sasha and advised on further improvement, suggested to make this as a more detailed online article, shared on the REAMIT website. Kate will discuss with Ram and others in meeting.

## REAMIT sub-group meeting, 23/06/2020

Attendees: Kate (UOB), Lohit (UOB), William (UU), Sasha (NTU)

### WP T1 Pilot tests

Kate announced the changes in REAMIT. Dunbia will no longer be a project partner of REAMIT. Ulster University will now be working closely with WD Meats who will also become a sub-partner of REAMIT. This process is now happening, the application for WD Meats to become a sub-partner in REAMIT is being completed to get them on board.

### Pilot test with WD Meats

William began updating us on their trials with WD meats. They will be installing sensors where the meat is stored in chambers/warehouses. William says that they will be looking to install sensors in the trucks. WD Meats will also be joining the RWP T1 meeting in July 2020.

UU has recruited a microbiology professor within the Ulster team to help along with trials. The professor at UU will be exploring a specific microorganism on cows that affects the quality of the meat, resulting in large quantities of wastage. William discussed with Lohit if a PCR approach could work, in the detection of the bug/microorganism.

William explains that temperature is an important factor, when meat is transported in vacuum packaging this allows gases to be produced and released quickly, whereas non vacuumed meats in lower temperatures will release gases slower. Lohit suggests a solution within transport to deliver some of the meat that is producing these gases quickly, can be delivered or re-rerouted to local demand points. This can be a REAMIT solution we can explore in future trials.

Kate says we will soon be setting a budget for WD Meats and liaise with the Joint Secretariat about it.

### Recruiting new pilot tests

Kate mentioned that French partners are struggling to recruit new pilot tests in France. The French Symposium in November will be an opportunity to showcase the French pilot tests.

Kate asked for our suggestions on how French partners can find a solution in recruiting 2 new pilot tests in France.

Lohit suggested looking at how the current French pilots (by UoN) are combatting the challenges faced during the pandemic and share those ideas with other French partners when approaching companies to carry out pilots.

William said that Ulster were supposed to find a 3D fluorescent sensor with FreshDetect but there was no response from them, which was a dead end. He mentioned there is an added value of sourcing 3D fluorescent sensors which are more expensive sensors – added to quantify how spoilt the food is.

### WP T2 Big data hub: Update on purchase

Big data hub requires further approval from the IT team at BED for the physical purchase. IT suggested to go for a cloud-based solution rather than a physical device. Lohit suggested to their IT team that a physical device



would be more suitable, but they have objected as the university prefers cloud-based system in order to reduce the number of physical devices purchased by the university. A physical server will incur additional maintenance costs. BED IT do not wish to be involved in the maintenance of this physical server. Lohit advised he will consult his team, so this request has now been put on hold. Lohit is preparing a statement to support the request for a physical device.

### **Report and Transcript**

Transcripts from Whysor and Levstone to be completed by Lohit and William. Report will be completed soon. Lohit will prepare a draft of another paper this weekend. Lohit will send a brief in email on this paper.

WP T3

No updates

WP Communication

Newsletter to be completed by end of month. Sasha has advised that the COVID19 report will be combined with this month's newsletter, combined with some of the previous comments from partners about the effects of the pandemic on their activities.

Events, media publications and other things to be updated on website.

Sasha discussed new animated video will be ready by 30 June.

Kate asked about actions for the Communication team to be reviewed prior to the RAC meeting. Particularly, infographics is outstanding. Will be required to be completed and ready at end of semester and ready for the meeting in July 2020.

### **Storage solutions**

Sasha has suggested to use Dropbox as a central storage place for REAMIT documents – Sasha to send email to explore the various subscription options within Dropbox.

### **WP Management**

Kate confirmed that BED would purchase Zoom pro for future online meetings of the REAMIT project team. During online meetings of RAC/WP/RSC there will be 10-min presentations from participating companies in the afternoon of day 1. William would invite WD Meats to also participate.

### **WP Long Term**

Kate confirmed a meeting between NTU, IR & Valorial was planned later this week. Kate asked Sasha to share communication materials with IR/ Valorial ahead of the RAC meeting. Communication team to create a set of bullet points to evaluate lessons learnt and key points for the next symposium.

## REAMIT sub-group meeting, 21/07/2020

Attendees: Kate (UOB), Lohit (UOB), William (UU), Sasha (NTU)

### **WP T1**

3D fluorescence pilot test: William will meet with Tahmina to discuss progress. Lohit will also attend. William said there was no update on this pilot test but UU were trying to obtain a new sensor to start the process. William said he was still learning about 3D fluorescence sensors, while Tahmina had solid knowledge of this type of sensors.

WD Meats: UU was expecting to get sensors from Whysor this week, so they would be able to test the sensors in lorries. WD Meats had some temperature sensors from Blairs Transport built in, with time stamps, so this information might be useful.

Lohit asked if the transport company were solely transporting meat from WD Meats.

#### **Action for William: To find this out.**

William shared some on screen data on temperature readings from the transportation of WD Meats. This was very simple temperature data. Not much can be done at the moment as WD Meats were closed due to lockdown.

Pilot test with Picnic: BED was supposed to buy sensors for Whysor but BED finance team questioned why sensors should be purchased and send to the NL. The company in Sweden where BED was buying sensors did not respond to BED's emails. BED would ask Whysor again to try to communicate with company in Sweden.

Pilot test with Weyers: No updates.

Raman pilot test: No updates.

Cyberbar pilot test: No updates.

Developing new pilot tests: Sasha said NTU were communicating with Tesco and would be sending out more information to potential end users.

### **WP T2**

BED is in the process of purchasing hardware and software. Kate & Lohit discussing how they will be buying them. The suppliers have been approved but there are discussions around the delivery of this product to the university's premises, as the buildings are still closed. Lohit asks more about purchasing including a checklist if this is required. Funder requests that the auditor provides a checklist (compliance with public procurement rules) for purchases of these types of items.

Meeting to be proposed with 4 partners, BED LEVSTONE WHYSOR SENX to discuss the data analysis and further tech specs required for BIG data hub.

### **WP T3**

No update on that.

#### **WP Management**

Kate amended REAMIT project application in eMS following the exit of Dunbia and WD Meats joining REAMIT.

#### **WP Communication**

Invitation for symposium to be included in the newsletter.

Update from JS – we do need to create new banners, just cover the logo of Dunbia with a sticker.

Sasha to review website and list all communication relating to REAMIT to be updated.

William will check with WD Meats if they have a high-resolution logo.

#### **WP LT**

Kate confirmed that BED team has recently made a presentation on the impact from the REAMIT project. It was presented at research workshop at BMRI focused on impact from research projects.

Kate confirmed that Ram started to look into the capitalisation call.

Kate confirmed that due to pandemic, the Expo in Germany has been postponed to 2021. REAMIT project was supposed to have a stand at this event.

## REAMIT sub-group meeting, 6/08/2020

**Attendees:** Katarzyna Pelc, William Duffy, Lohithaksha Maiyar

**Apologies:** Sasha Bennett

### WP T1

Fluorescence pilot test: William said prior to the next meeting with Tahmina, UU will get in contact with some of the new companies which had been mentioned during the partner meetings, these companies are Fluoretiq and Chelsea engineering and a third company. William also mentioned that he had not heard anything back from Matthias of FreshDetect and will have to try and re-connect with Matthias to see if any update is available. William said that when talking to James Dooley, their microbiology expert, that he doesn't feel that the FreshDetect 3DF sensor will be useful for the detection of Clostridium esters bacteria because although the equipment may be able to provide an indication of the total number of bacteria on the piece of food it will not be able to directly detect a specific bacteria. This total count of bacteria provided by the FreshDetect may actually provide a less specific indicator of spoilage though. William said that a distinct use case is required for the 3DF trial as none currently exists. William summarized saying that the next steps are to talk to James about potential use cases, contact Matthias and the other companies and the next meeting will be around the 17 August depending on everyone's availability.

William said that he has got the sensor which has been received from Whysor set up, and that Ulster University will likely order a similar sensor for the dry-aging trial as the restrictions on procurement appear to be relaxing. William said that he thinks within the coming weeks they may be able to order the sensors and they would like to order 30 based on previous plans they had to receive 30 from Tsenso.

Kate asked if they had budget for 30 sensors and William said that he will have to confirm this.

Kate asked if the 30 sensors will be installed within WD Meats and William said that they would.

Pilot test with Picnic: Kate said that Whysor had asked BED to order 20 sensors, however, this has been delayed due to problems with finance and procurement at BED. Kate said that unfortunately nobody has yet looked at it and it is still sitting on the desk but that they are starting to respond to people now. William asked why Beds are purchasing the sensors for Whysor and Kate responded that they have no equipment budget. Kate said that there was purchasing problems for the Whysor equipment because the information provided by the company is not sufficient for Beds purchasing procedures and insurance.

Pilot test with Weyers: Kate said that there has been no progress on the German test and no updates from France either.

Kate said that there also have been no updates from Cyberbar.

### WP T2

Purchase order was made for the big data hub but the person responsible was not available and that hopefully it will be underway today.

#### **WP T3**

No updates.

#### **WP Management**

Kate said that as part of work package management she has received minutes from both William and Lohit but not Sasha and she said she will email Sasha for an update on it.

#### **WP Communication**

Kate said that as part of WP Communication she had not yet received the WD Meats logo and William said that he had sent the logo to Sasha recently.

#### **WP Long term**

Kate introduced work package long term and said she had received an email from Blandine about who is available for the REAMIT symposium. She said that 5 people had committed to going from Beds, 4 physical and 1 virtual. William said that he had committed to physically going from Ulster University.

Kate said that a funding opportunity had come up from Innovate UK for small projects of up to 80k where the business would reduce the amount of plastic they were using. Submission for this project is in September. William asked if Kate could send the details on to him.

## REAMIT sub-group meeting, 20/08/2020

### WP T1 – Pilot Tests

Pilot test with Picnic: no progress here, as we don't have all the info from supplier of sensors in Sweden. Kate hasn't heard anything from the pilot supplier so Kate has asked Imke if she can check with them. We need to know things like the warranty and insurance of the sensors during transit from Sweden to NL.

Pilot test with Weyers: Weyers were also quiet during covid-19. Imke will be asking Weyers if they will still go ahead with pilot test, awaiting information.

Cyberbar pilot tests: no updates from UCD.

Raman pilot test: no updates from UoN or Images & Reseaux.

### Pilot tests at UU

William will be contacting WD Meats for an update. Waiting for Whysor to confirm that the sensor data is working to get the data into their REAMIT Cloud, for the Dry Ageing pilot. This will be locally connected to Ulster's local Gateway. The 3D fluorescence with Matthias has gone quiet also. Awaiting a response from Matthias as this has been taking some time. Kate suggests we could pay Matthias for external consultancy to incentivise him. This has been going on since February so Kate is asking what we can do to speed up the process.

**Action: Kate will speak to Ram about offering Matthias a VL contract.**

Kate says maybe we can get Matthias more involved in the project and join into weekly meetings. Meetings with Tahmina will not carry on until we hear from Matthias. UU is waiting for more input from Prof. James on Tuesday, so will have a better idea then.

### WP T2: Big Data Hub

Lohit says BED has initiated the set-up of the Big Data Hub, the order is with the supplier and all is approved within the procurement process. They are now waiting for the University to reopen to set everything up and install software to then build the platform. Lohit will send email to tech partners for updates on how the data platforms will be transferred to the cloud.

Data Hub setup: someone from the supplier will come and set this up.

**Action: Kate to write an email to supplier to ask not to deliver big data hub equipment to BED yet due to lockdown.**

Kate suggests William, while he works with Tom at Whysor, to develop a simple step-by-step document on what they are doing to connect sensors to cloud. This would be further developed and customised for other pilots.

**Action: William to create a step-by-step document on steps UU and Whysor take to connect sensors in UU pilot tests to REAMIT cloud.**

WPT3

UCD have not provided any updates.

WP Management

REAMIT Steering Committee meeting minutes – Kate advised she is currently putting together minutes, more than 30 pages to go through. Kate to complete these minutes now she has received the files from those who took notes during the meeting. The draft minutes will be ready to be sent out soon.

WP Communication

Sasha discussed the current focus is developing the September Newsletter for REAMIT. Sasha has contacted REAMIT partners for contribution to the newsletter, but no responses have been received. Kate suggests looking at the Progress report from last reporting period to get an idea of what to write about pilot tests. Kate suggested we could feature a section on the last steering committee meeting as well as a feature on the Big Data Hub and the upcoming Symposium. Sasha will draft this newsletter and chase partners for more input.

REAMIT Brochure – Sasha has been updating REAMIT Communication files and website with the removal of Dunbia and now including WD Meats' logo. An issue that arisen was that Ulster University has printed 200 copies so far of the brochure, which will be quite costly to present so many copies of the brochure, with the new updates.

**Action: Kate to discuss with Ram whether brochures and other materials will need re-printing.**

Sasha discussed NTU's current push to get new end users for potential pilot test. They are focusing on local Nottingham based agrifood companies as well as other companies across the UK. Waiting to hear back from contacts at Tesco and Pepsi. Sasha has been in touch with some companies such as Elysia Catering and Roboscientific limited, who are doing work very similar to REAMIT <http://www.roboscientific.com/> share with everyone to see potential for future collaboration

**Action: Sasha to share file that includes companies that NTU have contacted for pilots. Sasha to share spreadsheet of all potential end users being contacted for pilot tests.**

WPT Long term

Kate mentioned that we need to have an up to date shared database for REAMIT communication so we can keep a track of the companies we have been in contact with.

**Action: Sasha to send update on list of companies contacted so Kate can develop the database.**

Kate discusses which partners could participate in the next Symposium in France.

**Action: Sasha to send update to Blandine about which partners will be attending the Symposium.**

Storage space - TBC

Interreg NWE Capitalisation call will open in October 2020 and close in January 2021. REAMIT will be eligible to apply and BED will develop REAMIT capitalisation proposal with support of current and/or new partners. Kate will provide more information as soon as the call opens, and guidance is available.



## REAMIT sub-group meeting, 4/09/2020

Attendees: Kate, William, Sasha, Lohit

### **WP T1: Pilot Tests**

Kate says there are not many updates from partners since the last meeting but will be meeting with Imke on Monday to get updates on Whysor. Kate announced that Luuk is leaving Whysor soon.

Kate said that BED now has the green light to purchase 20 batteries and 20 sensors/equipment from Sweden to send to Netherlands. Whysor will use this for Picnic pilot test.

William said updated that Mattias did get back to them following the request from the last meeting, he will be sending the sensors next week. These sensors will give a better idea on what Ulster will do with the trial. Mattias is still configuring the sensors, although William has advised the sensors will not be useful in the long term. The real challenge is to find out if these sensors are suitable for food as they are usually used in the medical field. Maybe they are configured differently and need to be reconfigured to be used for food.

William has contacted the companies Ram has mentioned, now waiting for them to get back to Ulster. William would ideally like to set up a meeting with these companies to tell them more about the project. William would like to see if sensors from companies such as Chelsea technologies will help. He advised that Ulster was keen on taking on 3D fluorescent sensor pilot when we lost fresh detect but Kate is now asking how we can move forward with this, surely this pilot idea can still be executed?

Kate asks, is there any ways we can move on quicker with this? REAMIT has funding for additional support for research if needed. Kate says we should try figure out a way to work on this 3D fluorescent pilot. We can either get Mattias on board or seek sensors from a new company.

### *WD Meats*

William says he is struggling to get in touch with WD meats. They haven't responded to any queries, not said if they were happy for their company to be named in REAMIT promotional materials. They've not responded about dry-ageing chambers. Kate suggests for now, we should leave their name as anonymous for now until William has met with them and discussed in person. William advised he and James visited them last month but surprised they are now not responding. Will try contacting them again next week.

**Action: William to send us an alternative sensor to 3d fluorescent sensors.**

**Action: William to update us on any information from sensor companies next week.**

**Action: KP to update everyone on potential pilot in the UK.**

**Action: William to discuss with Joan on how to speed up the pilots. Find out how they will get in touch with WD meats to get them re-engage**

No new pilots for NTU as yet- NTU team are currently contacting potential end users, including follow up with Tesco.

Kate mentioned the Innovation Bridge project at University of BED, where academics meet up with companies to collaborate with them, to develop a longer-term cooperation with companies. Such as Innovate UK. There may be potential to meet some end users through this project.

#### WP T2: Big Data Hub

Lohit advises that Big data hub is progressing. Received portable disk and placed in server room. Will be used as a back up device. Once everything is set up, they will have a meeting with Whysor and Levstone. Lohit will book an engineer, to connect it to UOB network.

William says they have received a sensor from Whysor. Will be using this sensor temporarily connected to REAMIT dashboard, gathering data from this temperature sensor.

**Action: Lohit to follow up with XMA re what the channel is to send software to UOB**

#### WP T3

No updates

#### WP Management

KP has drafted minutes from RAC/WP/RSC meetings and will be sending out final notes next week. REAMIT Project officer at JS (Una) is leaving the JS. REAMIT will get a new project officer at JS.

#### WP Communication

Sasha discusses the development of the September Newsletter: received input from William, Lohit, pictures from UoN, not much information from other partners. Themes for the newsletter: RSC, Symposium, update on Big Data Hub (what the purpose of it is and what Big Data hub means to REAMIT and what we hope to get out of it – importance of big data hub). Sasha will also use information from the minutes to develop an article on pilot tests for the newsletter. There will be a section on meet the team. Do A company introduction on each company for each newsletter. Starting with Bedfordshire. Sasha will send draft version first for approval of ideas and then final version.

Re-printing of brochures – Kate says Ram has suggested for UU to reprint the 200 brochures that were previously printed. Need to have up to date logos and partner information. We have discussed that Ulster should wait a while before reprinting in case there are any issues with new partner, WD meats.

**Action: Check with image & reseaux If they are printing materials for symposium.**

**Action: Questionnaire chaser email– Kate to send out**

REAMIT Videos – NTU will eventually extend the Powtoons membership to release 2 new videos, including the new pilot test video will be amended– will be realised in January next year 2021 (need to speak to partners to let us use their names as this will increase credibility)

Sasha mentioned the development on case studies on impact of Covid-19 on food supply chains - contacted Elysia catering, on delivering surplus food on bicycles but the owner is away until mid-September so will reconvene the conversation. Sasha also found interesting articles on Food security and what the EU is doing to help food businesses.

### **WP Long Term**

We will need to be updated on the progress on the planning of the Symposium

**Action: Kate to contact Blandine, how they are planning to proceed, the role of all the partners in the symposium.**

Kate briefly mentioned the Capitalisation call for Interreg NWE. REAMIT should apply for this round of the call. Will discuss at a later date.

## REAMIT sub-group meeting, 22/09/2020

In attendance: Lohit, Kate, William, Sasha

### **WP T1**

#### **Pilot test with Picnic (NL)**

Kate confirmed that BED purchased 20 sensors and batteries from Elsys. Elsys said equipment would be shipped to Whysor in second half of September. BED waited for confirmation from Elsys that equipment was shipped to Whysor.

#### **Pilot test with Weyers (Germany)**

Imke from Whysor confirmed that Weyers were ready to reassume work on the pilot test and will send update by end of the week. Ram, Kate, Imke and Marcel had a meeting recently and Marcel said he was happy to work with William from UU to help him with sensors and connectivity.

#### **Raman spectroscopy pilot test (France)**

KP confirmed that UoN and Whysor were discussing frequency of sending data to cloud from Raman pilot test.

#### **Cyberbar pilot test at UCD (Ireland)**

Kate confirmed there was no news from UCD since July.

#### **3D fluorescence pilot test (UU)**

William confirmed that Matthias offered to send two 3D Fluorescence sensors to UU. Joan was addressing issues raised by UU (procurement team) related to insurance of equipment in transit (from Germany to UK). Value of each 3D sensor is a few thousands GBP. However, Mathias would lend sensors to UU free of charge. Practically these sensors don't exist anymore in the market. Mathias is happy that UU use them for research work and returns when the research work is finished. Kate suggested that UU find out about Mathias' interests in REAMIT in order to explore ways to involve him further to gain more out of his expertise for the project. Marcel confirmed that Whysor should be able to assemble sensors similar to these from Freshdetect.

#### **Pilot test with WD Meats (bacteria)**

William confirmed that UU and WD Meats have recently signed collaboration agreement. Prof James contacted his collaborators in Ireland to better understand ways to detect bacteria on meat. However, UU had no further news from Prof James regarding ways to detect bacteria on meat.

#### **Pilot test with WD Meats (Dry aging chamber)**

WD Meats seemed less interested in this pilot test despite having confirmed this as a legitimate food waste problem during earlier meetings. They also did not want to spend any budget on this trial as they wanted to invest as much as possible in the Clostridium bacteria trial.

UU confirmed to WD Meats they would buy a smaller number of sensors out of UU's budget to run a smaller dry-aging trial. WD Meats had also mistakenly thought that the sensors only had temperature tracking capabilities. William confirmed to WD Meats that they measured also relative humidity and WD Meats agreed they would run a small version of the trial.

WD Meats wish to resume the dry aging pilot after Christmas because they would be dealing with a generally high demand on meat before Christmas. They seem slightly uninterested given the fact that REAMIT is currently providing only temperature sensors and they would want to measure humidity as well.

William confirmed that he experienced challenges with connecting gateway to cloud. Documentation for setting up the connection seemed outdated. The system read from sensors but did not transmit data.

William confirmed that UU was developing a database of food producing companies in the region to understand who else could be invited to pilot tests. Lohit suggested to make a similar list of companies in other partners' regions and approach them just the way companies are approached for the sensor review. Kate suggested there should be some legal organisation or ministry responsible for providing permissions / monitor compliance with standards of companies that work with / produce meat, pork, chicken and fish. Lohit suggested Food and Agricultural organisation is an international organisation that produces various food policies and reports statistical data across the world. There should be an organisation at national / regional level in the UK that has similar objectives. Such agencies may help to reach out to companies and have a database of companies working in food sector.

Kate said that communication between Whysor, BED and UU needs to intensify to ensure progress in the implementation of pilot tests led by UU.

**Action: William to send an email to Tahmina to discuss how to move forward with 3D fluorescence.**

**Action: William to share information about alternative sensors (to 3D Fluorescence).**

Developing pilot test with milk consortium in France

Kate confirmed that Valorial sent an email last week saying that the milk consortium (BbaMV) would not participate in developing REAMIT pilot tests on the basis that: i) Dairy industrial products are not very prone to losses leading to food wastage; ii) The number of projects already committed to date within the BbaMV consortium is very high, and their capacity to mobilise time on new actions is close to zero for the coming months; and given the REAMIT timing, it does not seem wise to commit; iii) Other topics have been prioritised within BbaMV.

**Action: Kate to send email to Whysor regarding organisation of online meeting between Whysor and UU to discuss shipment of sensors to UU and helping connect gateway to cloud.**

## **WP T2: BED Big Data Hub**

Lohit confirmed that Big Data hub equipment has arrived at BED. BED would need an engineer from the supplier to help install the equipment.

Lohit received the licence for XMA software.

Lohit asked Kate if the process around paying the supplier has been completed. Kate advised she would check it with finance.

**Action: Kate to ask Khalid (BED) if he has all the paperwork related to purchase of Big Data hub equipment.**

Rob has access to the room in the university where equipment is installed. Once installed, Lohit can access the server remotely so he will not need a key to access the server room. Lohit will ask engineer how to do software updates and to set up the remote access.

Lohit would like to go ahead with software installation and data testing so he will get in touch with the engineer for a half day visit. Lohit will consult Tahmina for authorisation of the installation, as she is in the department of Computer sciences.

### **WP T3**

No updates.

### **WP Management**

Kate confirmed that REAMIT progress report and payment claim have been submitted to BED auditors. Deadline set for submission of 3<sup>rd</sup> progress report and claim to funder is end of September.

Kate worked on updates in REAMIT Application Form in eMS to reflect WD meats joining and Dunbia exiting REAMIT. Kate experienced difficulties with the system and would meet with the team at Joint Secretariat to resolve it.

Una Bruhann (REAMIT officer at JS) will be leaving her role at JS at the end of September. Matthew Thompson has been appointed as REAMIT officer at Interreg NWE Programme Joint Secretariat.

### **WP Communication**

Sasha advised that this week, the priority for the communication team is finalisation of September newsletter. Sasha will include update from Lohit and feature a 'meet the team' section in this and future newsletters. Sasha will feature 2<sup>nd</sup> Symposium and past events attended by REAMIT partners.

The REAMIT website has been updated ie information about Dunbia has been removed.

Sasha asked whether to include WD Meats as partners on the website.

**Action: Kate to check with Ram if information about sub-partners should be provided on the website.**

Kate confirmed some partners still have not developed REAMIT banners. BED and NTU are assisting them in developing banners in line with funders' publicity requirements.

**Action: Sasha and Kate to collect pictures/videos/images of banners from all partners.**

### **WP Long Term**

2<sup>nd</sup> REAMIT Symposium scheduled in France will take place online. The new proposed agenda indicated it would be a 3h online event. Ram inquired whether it should be a full day event. Following Ram's request, the event was prolonged by 1h. Valorial sent an updated agenda to partners.

Kate and Sasha attended the Smart Food Factory online event, whilst Tahmina Ajmal from BED was a guest speaker.

Kate attended World Agri-Food Innovation Summit.

Not much to discuss on the capitalisation call yet.

## REAMIT sub-group meeting, 6/10/2020

Attended by Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar and William Duffy

WP T1: Pilot Tests

*Whysor pilot test with Picnic (NL)*

We have received confirmation from Whysor that they have received equipment from Elysys. They need 3 weeks for sensor configuration.

*Whysor pilot test with Weyers (Germany)*

Imke contacted Weyers and they are ready to resume work with Whysor.

*UCD Cyberbar test*

Kate confirmed that the only information she had from UCD was that in September, UCD authorities would re-assess the COVID-19 situation, and whether new staff could be employed & if people could access the buildings.

*3D Fluorescence Pilot test – Ulster University*

William said UU were looking into a warranty and insurance of sensors during transit.

William, Tahmina and Joan met online with a company called 'Flueretic' (re spectrometer). They asked Flueretic if there was some technology using spectroscopy to detect clostridium bacteria.

William discussed that they would need to look at the budget for this technology. The prices of the equipment and the costs of research are very high.

William said things at Ulster were moving very slowly.

Imke has been in contact with Mattias of Fresh Detect.

William believed Mattias should be compensated for his involvement in REAMIT.

Kate suggested the process of communication with Ulster's procurement team was lengthy. She asked if there was an alternative scenario of how to arrange the transport of sensors from the NL to UU (UK). Kate suggested that Mattias could arrange the transport of sensors and claim costs from UU.

Marcel would like to see the sensors from Mattias. Kate asked if Mattias could ship one of these sensors to Whysor. William confirmed he could send over a sensor once they received it at Ulster.

William will discuss this further with Joan.

William will keep emails to Mattias at a minimum, as he does not want to keep contacting him until things are definite, such as insurance of sensors during transit.

**Action: Following up on Joan's email, setting up another meeting with Flueretic and Prof James to discuss how UU can proceed with 3D Fluorescence pilot test. A Plan B would be needed in case things do not work with Mattias.**



**Action: William to get prices for other 3D fluorescence sensors from other 2 companies mentioned by Tahmina.**

Lohit asked if William was able to send the requested information to Fluoritic, William replied no since he had not heard from Prof. James on this.

Kate said we would need to start showing some progress soon as the last few months have been extremely quiet, and we would need to complete 4<sup>th</sup> REAMIT progress report in December.

#### *Dry Aging Chamber pilot test (UK)*

Northern Ireland is struggling with the COVID-19 situation and MD Meats have now a very busy 'Christmas' period. They said they would not be able to work on dry aging chamber pilot test until after Christmas. This implies that REAMIT sensors cannot be installed at WD Meats until after the Christmas period. William advised he cannot access the Dry-Aging chambers at WD Meats as he had no access to the company's sites and to the university's building. He will configure sensors for dry aging chamber at home.

#### *Clostridium bacteria pilot test (UK)*

William advised that PCR (Polimerary chain reaction) kits would be used at Ulster's campus in Coleraine, Northern Ireland. Dr James is based there and will train students to detect the bacteria through swabbing at WD Meats. This is nearby to WD Meats sites, so they will be able to benefit from this research.

William advised that WD Meats aren't as interested in the dry ageing trials, but more in detecting the clostridium bacteria because it costs them more money and causes big meat losses.

**Action: Specify timing from Prof. James for getting a student on board at UU and getting samples from WD Meats.**

#### *Pilot Test with Weyers, Germany*

Imke emailed Kate on 28 September and confirmed Whysor met with Weyers on 15 September. They had huge growth in sales in the last months and could not focus on the REAMIT pilot test. They are ready to proceed with pilot test with Whysor. Sensor device will be installed in the Weyers' trucks soon.

#### *Raman Spectroscopy pilot test, France*

UoN has started taking measurements again. Now they have received data, they have discussed with Whysor when they can start transmitting data from sensor to cloud. Since Fabien has left Whysor, Imke had to ask someone else at Whysor about data transmission.

Whysor will be having regular online meetings with UON. There will be an online meeting on frequency of data transmission between Whysor & UON.

#### *Developing new pilot tests*

The egg consortium in France are no longer interested in REAMIT pilot tests.

UON and I&R have talked to 3 companies about their participation in pilot tests in last month, but they had no responses.

Whysor explored possibilities for developing new pilot tests – one in the NL and one in Germany (pork meat producer).

Kate confirmed there would be regular monthly meetings of WP T1, facilitated by IR. The first meeting will take place online on 19 October 2020.

#### **WP T2: Big Data Hub**

Last week, the engineer went to BED to install the server. The server has now started and is switched on. Lohit wanted a set up enabling him to work remotely but needed further elevation by the IT at BED. Currently LM is waiting for IT to action this. They will need to enable the IP address to the university's domain to allow remote working. Still need to install some of the software that have been purchased. The Operating System (OS) is already installed. These are the next steps that Lohit will be doing. There will be additional permissions and security issues regarding Lohit's request to work from home, if they allow.

These are the next steps:

1. To complete installations on Big Data Hub
2. Set up Big Data Hub remotely
3. Access data in the cloud

#### **Actions for Lohit:**

1. **Raise a request to ICT to register the IP address on the University domain.**
2. **Setup remote working from the University.**
3. **Raise a request to setup remote working from outside University.**
4. **Install SQL server software**
5. **Install other software (like Apache Spark) if needed for developing the software platform to receive big data from REAMIT cloud.**
6. **Work on developing a secure software program to receive the data on the cloud.**

Lohit confirmed he would organise and chair WP T2 monthly meetings. The first one would be organised in October.

**Action: Lohit to send out invitation to WP T2 meeting in October.**

#### **WP T3 Business Development of REAMIT technologies**

No updates. We are behind schedule in this work package. Involvement of UCD in the project needs to be discussed.

**Action for all: To go through REAMIT Application and understand more about WP T3 to prepare for a discussion at the next sub-group meeting.**

#### **WP Management**

Kate reported that there are no issues from the auditor with reports from partners. 3<sup>rd</sup> REAMIT progress report and payment claim were submitted to JS on 2 September 2020.

Request for approving a change in the REAMIT project has been approved by JS (exit of Dunbia and WD meats entering).

BED requested a 12-month project extension, including financial extension. Kate will be contacting partners to ask if they will co-finance their part of the extension of the REAMIT project.

#### **WP Communication**

The September Newsletter has been published and distributed to contacts and on social media. Sasha is requesting project leads and partners to actively share items such as the newsletter on social media.

**Action for all: Actively promote newsletter on all social media.**

**Action: Sasha to publish Lohit's interview on website.**

Sasha discussed making these publications of interviews with different REAMIT members as a regular feature on the REAMIT website. Lohit said it would be good for next time to focus on data analytics partners such as SenX or IT Tralee. We can invite Hervé to participate. Everyone has their own expertise so it would be good to showcase these talents. This will emphasize what these partners will contribute to REAMIT.

The team discussed whether we should release another newsletter before December. Kate suggested we should see how much we have to say during this time. We may be able to release a November issue. An idea could feature 3 people on data analytics for the newsletter. Or possibly release a November – December newsletter.

Videos – work on video on pilot test throughout October. To be displayed in time for the Symposium.

**Action: Sasha to contact Blandine to request REAMIT video to be played at the beginning of the Symposium; and play the other video in between presentations.**

**Action: Sasha to continue to promote the REAMIT Symposium and promote pilot test invitation.**

Kate said that not all partners have developed roll up banners. Partners who confirmed they developed it: Levstone, SenX, UU, Whysor, BED, NTU, I&R, ITT. Partners who have not done it: UCD, UON.

**Action: NTU to chase partners for images of banners and roll ups.**

**Action: Sasha to include and upload roll up images on website.**

**Action: Kate to check with Ram if roll ups are okay on the website.**

#### **WP Long Term**

Kate asked that everyone promoted the REAMIT Symposium through social networks.

BED did not yet discuss the capitalisation call.

EU Regions Week workshops start today. Kate and Sasha will attend some sessions.



## REAMIT sub-group meeting, 20/10/2020

Attended by Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar and William Duffy

### WP T1: Pilot Tests

Kate provided the following updates:

Pilot test with Picnic: Picnic (NL) received sensors from Elsys in Sweden. Whysor will be configuring sensors now and will install them in Picnic's truck in 2-3 weeks (early November).

Pilot test with Weyers: Imke mentioned she had some sensors at the Weyers office but could not visit the office due to lockdown. Recently Imke visited the office of Weyers. There are iron walls there where the sensors were fitted which affected the connection of the sensors, and the connection is now restored.

Imke will be taking pictures on sites of both pilot test companies for REAMIT communication purposes (videos).

Cyberbar pilot tests: Not much update from UCD. Ram has emailed UCD to find out what their future role and involvement in the REAMIT project would be. The involvement of UCD is now becoming a risk.

Pilot test with Raman Spectroscopy: UoN is now looking at meat samples from Routheau. However, the work that they are doing may not be considered as a REAMIT pilot, so this is concerning.

Ram asked how we can get this technology on the road, as so far, no transportation aspect is involved in this pilot test. Ram asked for another pilot test in France where food quality can be tested during transportation.

3D Fluorescence pilot test: William hopes the sensors from Matthias will be shipped this week or next week (end of October). William spoke to Joan about bringing Matthias in as a visiting lecturer. Joan would rather wait until they've received the sensors from Matthias to see if it was useful. If so, they will involve Matthias within the REAMIT project.

Dry Aging chamber pilot test: UU has received sensors for the dry ageing trial. They were purchased from a Chinese company producing sensors.

Clostridium bacteria pilot test: William confirmed that UU has the labs and equipment and some students have started a training on how to carry out swop trials directed by Prof. James. Once William knows which PCR kits to buy, he will purchase these. As the situation in Northern Ireland worsens with Covid-19, it will be very difficult to go on site at WD Meats. William will be meeting with Prof James next week at Ulster (end of October).

Marcel from Whysor would like to see the sensors from Matthias to see if they can assemble similar sensors.

**Action: William to discuss with Joan if it is an option for Ulster to send one of the 3d fluorescence sensors to Whysor in the Netherlands.**

*New pilot tests in the pipeline*

Pilot test with Yumchop: Kate announced BED is liaising with Yumchop – fresh food producer company in the UK. Yumchop agreed to participate in REAMIT pilot test. They agreed to allocate 2 hours a month to develop REAMIT pilot test. BED offered a visiting lecturer contract to Michael (CEO) from Yumchop.

First online meeting of WPT1 took place yesterday (19/10) and the second meeting is scheduled for 16 November.

#### **WP T2: Big Data Hub**

Lohit has ordered equipment called Switch which connects the internet connection to the server port. He will need this equipment to set up 2 IP addresses. Once this is procured with IT, we can get things started. Lohit had a meeting with Gael, Imke, Ram, Ali and Fabien. All tech partners discussed the development of getting data into the Cloud and starting data analytics. There were suggestions that they could use temporary solutions like Google cloud to download the data for data analytics.

BED is seeking to have a central storage space to store all the files. BED's IT department recommended the Western digital cloud 4tb storage device. Ram was happy with this but UOB says this device needs to be connected to the university's internet server and they will not permit this. Lohit suggested for Sasha to get in touch with Prof U. Ramanathan at NTU to find out if NTU will allow this device to be located and connect on their premises.

**Action: Sasha will check with Usha and ICT at NTU if this storage device can be connected at NTU, as this device will need a physical space for this to be connected to the university's WIFI. Lohit will share the link to the device.**

Lohit will be making plans for the meetings on WP T2, to discuss what kind of data analytics they want to do and what data they want to analyse. Lohit will send an email to partners to see what types of deliverables will be required. From this point, they will see which tech partners are relevant to attend this meeting.

**Action: Lohit to inform Ram about these meetings. First one in October then one in each month. Lohit to invite relevant tech partners to the next WP T2 meeting.**

#### **WP Management**

REAMIT report has been submitted to JS. JS has paid the 3<sup>rd</sup> tranche of funds to BED. BED has actioned payments to partners.

BED has no news on REAMIT project extension and financial extension from the funders. BED sent to JS all the required documentation.

Shantanu's VL contract will be extended.

A new VL contract is being developed for Yumchop.

#### **WP Long term**

Interreg NWE's Capitalisation call has been announced last week. The capitalisation proposal is for approved projects such as REAMIT. This will allow us to access new regions, new partners and give us opportunity to

extend project and some existing project activities. The info event about Capitalisation Call is on 5 November, which is the same date of the REAMIT Symposium.

Sasha emphasised that it was important to encourage partners to register for the Symposium.

**Action for Sasha: To update the REAMIT website with link for registration of the Symposium.**

**Action for all: To register for the Symposium and continue promoting the Symposium on social media.**

**Action for Kate: To send email to REAMIT partners to encourage them to register for the Symposium.**

#### **WP Communication**

**Action: Sasha to contact Blandine today about including the video during REAMIT Symposium.**

Sasha asked, should we push partners to continue to print roll ups if they haven't printed? Kate said it might not be required right now, especially due to lockdown restrictions and lack of access to premises.

**Action: Kate to check with Ram if roll ups need to be printed up urgently.**

#### **WP T3: Business development of REAMIT technologies**

UU is the leader of this work package so they will need to discuss with UCD how we can proceed. UCD has not been responsive for a while about this work package. Our sub-group will need to brainstorm on how we start working on WP T3. We will need the expertise to be able to complete these deliverables. Elaine Ramsey from Ulster will be able to help so William will discuss this with her at the next meeting at Ulster. Kate suggested we will also need to know what data we need from Life Cycle assessment to proceed with this work package.

**Action for William Kate and Sasha: To discuss with our managers how to proceed with this work package.**

**Action for William: To discuss with Joan – do we have in-house expertise for WP T3 and whether Elaine could help.**

**Action for William: To discuss with Joan how to implement WP T3.**

**Action: Kate to discuss with Ram how to proceed with UCD due to silence and lack of response.**

**Action William and Kate: To discuss where to get the expertise to be able to deliver WP T3.**

**Action for Lohit: Send email to UCD to find out what data will be needed for life cycle assessment.**

**Action for all: Review the minutes from RAC/RWP/RSC meetings in July. It is a lengthy document with many actions for all partners.**

Next meeting: Tuesday, 3 November at 12.00 pm.

## REAMIT sub-group meeting, 3/11/2020

Attendees: Katarzyna Pelc, Lohithaksha Maiyar and William Duffy

Apologies: Sasha Bennett

### **WP T1**

#### *Pilot test with Picnic*

No updates since last meeting.

#### *Pilot test with Weyers*

No updates since last meeting.

#### *Cyber bar pilot test*

UCD confirmed they would present Cyber bar pilot test at REAMIT Symposium on 5 November 2020.

#### *Pilot test with WD Meats – dry aging chamber*

UU has not been able to do configuration of sensors yet. UU does not think they will be able to start this pilot test before Christmas.

#### *Pilot test with WD Meats – Clostridium Bacteria*

- A student from UU will shortly start a training to be able to take swabs from WD Meats
- UU needs to procure the kits for swabs
- UU hopes this pilot test will start before Christmas but it depends on WD Meats' procedures during Covid. This pilot can start as soon as WD Meats writes back to UU and proposed the date when the swabs (samples) can be taken.
- Swabs will be taken to the lab at UU to analyse if bacteria are there or not.
- UU will use PCR to see where the bacteria is and which parts of WD Meats factory have the bacteria.
- WD sent an email to Prof James about meeting with Jaap from Sensip-dx. WD will arrange a meeting between Mark (WD Meats), Jaap and Bart from MU to figure out if their sensor can work inside WD Meats. Mark confirmed that the place where the meat is packaged is the worse place in the factory (most bacteria is probably there). We would collect liquid from the belt to test for bacteria with the sensor from Sensip-dx and MU.

#### *Sensors from Freshdetect*

- Devices were shipped by Matthias and were supposed to be UU by now, but since DHL classified them as dangerous, they were sent back to Matthias (because of batteries).
- WD asked UPS, but they will not transport it to NI either.
- UU started to explore other options ie sending it to Whysor and then Whysor shipping it to UU. This involves new warranty arrangements though.
- It is a big challenge to order batteries in NI – because they can go on fire during transportation by plane (lithium battery)



## **WP T2**

**Action: Kate will purchase switch and cables.**

**Action: Lohit will send email to Levstone.**

Shared space at NTU – if we update a file, it needs to be visible to everyone.

Is this storage space open to all partners – for both common files and private files?

**Action: Lohit will check it with Usha and Sasha if it is possible to have different levels of access for different people.**

## **WP T3**

UU happy to set up monthly meetings of WP T3 but we will wait for 3 months (February 2021) until progress has been made with pilot tests.

Lohit is waiting for feedback from UCD on data requirements for LSA.

Market readiness level is linked to technology readiness (TR) level. We may have some meters for market readiness and technology readiness. TR is one part of market readiness. Our business development agency partners (I&R and Valorial) in REAMIT may be able to help us to better understand technology and market readiness.

**Action: Kate will discuss with Ram how to proceed with getting some insights into TRL.**

## **WP Management**

No news yet re extension of the REAMIT project due to COVID.

## **Long Term**

We need to book B2B meetings with food companies attending the Symposium to discuss with them new pilot tests in France.

## **Capitalisation Call**

Second meeting with REAMIT partners to discuss ideas for REAMIT Capitalisation proposal will take place around mid-November.

Next online meeting of REAMIT sub-group will take place on 17 November 2020 at 10 am.

## REAMIT sub-group meeting, 17/11/2020

Attended by Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar and William Duffy

### WP T1: Pilot Tests

Kate provided the following updates:

- *Picnic (NL)* have purchased 20 sensors. They are being configured to detect shock within a box of up to 50 cm. 2 sensors are ready to be installed in a truck.
- *Weyers (Germany)* – Whysor are waiting to hear back from Weyers for an update.
- Whysor are discussing developing a new pilot test with a new Dutch company.
- *University of Nantes Raman Raman spectroscopy trials* – UoN are now using new samples of meat from Routheiu. After this second test, they will be ready to move the pilot tests to a truck. UoN plans to perform another round of data collection from fresh fish samples provided by a company producing fish – Pescanova.

William provided the following update:

UU: There are no updates from the dry-ageing trials, there has been no progress. *Clostridium trial* – William has spoken to lab staff about which kits to buy. UU will procure the PCR lab kits but timeline of this process was not certain due to COVID-19. Once the placements students have been trained, they will be able to start collecting samples from WD Meats (with PCR kits) and analyse them in UU labs UU has now received two Freshdetect sensors (3D fluorescent sensors) and are now figuring them out. William will test the sensors in his own house to see how they work. Due to lockdown, he is still not able to go on site of the university or WD Meats. William said they had a meeting set up on Thursday with WD Meats to discuss technical issues with clostridium bacteria trial and see if they had a solution. UU would be meeting with an Italian company interested in the clostridium bacteria pilot test.

- *University of Bedfordshire:*

Kate said BED discussed a new pilot test with a ready to eat frozen food producing company based in the UK – Yumchop.

Kate had a b2b meeting with a consulting public company in France who said they would help identify fresh fruits and vegetable producer company in France for REAMIT pilot tests.

- *Nottingham Trent University:*

Kate said that in the last RAC meeting (July 2020), NTU confirmed they would contact Pepsico, and a number of other companies, to invite them to REAMIT pilot tests. Kate asked about progress on this action at NTU.

Sasha mentioned there were a number of new communications between Nottingham City Council and NTU which might result in identifying new companies for REAMIT pilot tests.

**Action for Sasha: to discuss with Usha the prospects mentioned in the last RAC meeting of all the companies NTU said they would contact.**

- UCD Update:

Kate said that at the recent WP T1 meeting, Dimitrios Argyropoulos from UCD confirmed there would be a second pilot test in Ireland focusing on mushrooms.

#### **WP T2: Big Data hub**

Lohit has discussed with ICT about the issues with connecting the REAMIT Big Data server to the university's network and through the university's security. Lohit explained this security is to protect the system from unintended access. Lohit suggested the server might need to be shifted to a different room. ICT will have to clarify whether they will need to raise a request to shift the server to main room. The server is switched on but cannot be accessed from outside as the remote access has not been set up yet. Lohit may need to purchase additional subscriptions and licensing so that external REAMIT partners can access the server. Lohit will be speaking with XMA and Microsoft for allowing external access to the server.

**Action: Lohit to contact Levstone about their outstanding actions under WP T2 and for their involvement with the Big Data Hub and their smartphone application. Lohit to ask Levstone if they thought of any architecture that would support all pilot test; and role of SenX in collecting data from UoN pilot test.**

#### **WP T3**

Kate, Ram and Lohit had a meeting with UCD about the kind of data needed for Life Cycle Assessment of different REAMIT technologies. UCD committed to developing a template document for what kind of data (standard and specific) they would need from each pilot test.

#### **TRL levels**

The meeting attendees discussed market readiness level of the technologies produced by REAMIT. Kate confirmed that UU, as lead of WP T3 needed to start exploring issues related to market readiness level (MRL) and technology readiness level (TRL) and make a presentation about it at the next REAMIT round of meetings on 20-21 January 2021. William confirmed that UU would explore texts on levels of technology readiness and Kate suggested that the Interreg NWE Programme Manual contained some valuable information, as a starting point. Kate offered to also check if Innovation and Enterprise Service at UOB had materials to share on TRL. Exploring TRL may be an ongoing process over the next year in REAMIT. The process aims at developing shared REAMIT approach to TRL. Knowledge developed by UU on TRL with support and feedback from REAMIT partners will be presented in a document: 'REAMIT approach to TRL'.

**Action for William: to start reviewing information on TRL (e.g. from Interreg NWE Programme Manual, internet, etc.) and update sub-group at next subgroup meeting.**

#### **WP Management**

Kate confirmed that REAMIT Project extension has been approved until 9 July 2023. We will need to rethink activities and budget needed for the extended REAMIT project. Partners will have to consider their savings so far and estimate how much money they would still need until 9 July 2023. Interreg NWE's JS has agreed to consider a financial extension too.

Kate confirmed that July – December 2020 reporting will commence soon for all partners. Activity reports need to be completed by 18 December 2020, and financial reports by mid-February 2021.

Kate said that during a recent meeting with UCD, Shane Ward from UCD confirmed that Dr Dimitrios Argyropoulos would support the work on REAMIT at UCD until two post-doc researchers were recruited in spring 2021; UCD struggled with recruiting staff for REAMIT due to COVID-19; and that UCD was happy to host RAC/WP/RSC meetings in January 2021.

#### **WP Long term**

Kate mentioned that the REAMIT Symposium seemed to be a success. The speakers, presentations, moderation and interpretation – all was very good.

REAMIT Capitalisation proposal: Ram was keen to contact some new companies who would be partners in the REAMIT Capitalisation proposal. REAMIT Capitalisation proposal would focus on reducing food waste in liquid foods such as milk, yoghurt, smoothies and fruit juices. The second REAMIT Capitalisation meeting was expected at the end of November.

#### **WP Communication**

Sasha confirmed she developed a new newsletter mainly based around the symposium. Sasha would await input from partners to proceed with additional content.

Sasha confirmed she also worked on case studies. Ram suggested that Sasha liaised with Lohit to develop REAMIT case studies. Lohit mentioned using information from the slides in his presentation – the first few slides on pilot tests to look at different kinds of data to be discussed in case studies as a starting point. Lohit also suggested using acronyms such as Company A, Company B, Company C. He mentioned these could be combined into one case study or separate ones. One idea was to explore how each of these scenarios would reduce food waste.

Kate requested updates on the REAMIT website. The News section needed updates with a brief new heading about the Symposium and a link to the symposium website. Kate asked for updates in the 'Events' section by uploading presentations from the Symposium.

Kate asked when NTU would organise a training session for REAMIT partners on social media. A training would need to be organised in the current semester.

**Action: Sasha to discuss with Usha the social media training session for REAMIT partners.**

**Action: NTU team to check actions from July RAC/WP/RSC meetings.**

## REAMIT sub-group meeting, 1/12/2020

Attended by Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar, William Duffy & Gautam Samriya

We wished a warm welcome to Gautam Samriya, a new staff member from IT Tralee.

### WP T1: Pilot Tests

There were no updates from Whysor on the Dutch or German pilot tests.

UCD Pilot test: Kate confirmed that Shane and Fionnula are the main contacts and clarified the confusion about the new member of staff. Progress will be very slow until March April next year, due to being short staffed because of COVID.

No updates on French pilot tests.

Dry-Aging Trials: No updates. Still being held off by WD Meats.

Clostridium bacteria: UU partners had a meeting with James Dooley about Clostridium trials to figure out whether the technology will detect the clostridium bacteria as the technology is not that sensitive for that level of detection. WD Meats had a bad outbreak of COVID and dropped off the radar. Many staff from WD Meats are not working due to COVID. WD Meats are interested in the technology provided the threshold will allow for detecting the bacteria. WD Meats is low on staff so this may cause some delays. Mark from WD Meats was not in the meeting so he is the final decision maker whether they will use the technology.

The placement student is waiting for the DNA extraction kits to arrive. UU are waiting for the go ahead from WD Meats to start with the PCR testing on site of WD Meats.

The American/ Italian food packaging company called SealedAir that contacted Ulster during the REAMIT Symposium are very interested in the technology to detect clostridium bacteria.

Kate suggested if they have bases in the NWE REGION, they could be a potential pilot test partner for REAMIT. They have a base in the Netherlands so this could be covered. William said UU would look into it, once UU have proven the technology works for the purpose.

William is not expecting much communication from WD Meats until maybe after Christmas. Once they have the bacteria, they will send samples to Maastricht University to detect and identify the clostridium bacteria and send the information back to UK.

If WD Meats do not allow anyone on site, Mark from WD Meats can take a swab of the bacteria himself and send it to UU and Maastricht University.

William said they have been sending out questionnaires to some companies to find out about what issues they've had with resource efficiency and food waste - NAKED foods have come back to them. They produce fresh sausages, but they don't have food waste issues at the moment.

3D fluorescence sensors: Freshdetect sensors were being configured and tested on cooked chicken and minced meat. William said he doesn't understand the numbers and data coming from the sensors so may need some training on this. Kate suggested he can discuss with Matthias Heiden how to use these sensors. William will take some more time to understand the sensors by himself first.

### *New pilot tests in REAMIT*

University of Bedfordshire: Yumchop is UK based SME which produces frozen foods ready to eat in vending machines. They are interested in participating in REAMIT pilot tests and REAMIT Capitalisation project.

NTU: has had some interest from TTK Confectionery but nothing has been discussed as yet.

Kate suggested that we show on eMS in the next report on how many companies we have been contacting and the lack of responses. This is to be documented in the next report.

Potential trials: Ram and Ger Corkery (ITT) discussed how we can use Gautam's expertise in future pilots. Ram suggested to use the idea from the previous Freshbox project as a potential pilot test with ITT.

**Action: Gautam to present Freshbox project concept at the next meeting of the Sub-group.**

### **WP T2**

Lohit briefed Gautam about the purpose of the Big Data hub at BED and his work ICT team at BED to ensure the connection is secure. Lohit made a request to ICT for the server to be moved to a new room. There was a long meeting with ICT about it yesterday and ICT agreed that the Big Data server could be moved to the main server room. Lohit has had training on how to access the room and now he has the permit and necessary training to use the room. Tomorrow, they will be transferring the server to the main room. Lohit will be trying to enable remote access. He will need to also set up some external users and solve any other software issues.

### **WP T3**

No update from UCD on Life Cycle Assessment.

Kate mentioned they discussed preparing a paper on technology readiness. A 1 hr session will be held the next RSC meeting in January 2021 run by UU to present technology readiness and market readiness levels. William is waiting for their monthly internal meeting to discuss with the team at Ulster how to prepare a relevant session for the REAMIT meeting in January.

### **WP Management**

Kate confirmed that a 12-month extension has been approved by Interreg NWE Programme Joint Secretariat. Interreg NWE Programme Monitoring Committee will meet in March/April 2021 and they will then formally confirm REAMIT 12-months extension. Kate will be contacting partners to request information on the 12-month extension project from each partner i.e. how much budget each partner has spent so far; how much money they will need for the extension period. In the 12-months extension period, REAMT partners will need to organise another symposium and two REAMIT project team meetings.

Kate sent out emails to partners, asking them to improve quality of reporting in eMS. Partners need to report per deliverables in eMS.

Partners were reminded to 'book' their auditors now, in time for the financial reporting.

REAMIT has a new project officer, Matthew Thompson, at the Joint Secretariat in Interreg NWE Programme. He may attend REAMIT online meetings in January 2021.

The invite to the next meeting of REAMIT AC/WP/SC has been sent with Eventbrite link.

### **WP Long Term**

Blandine from Valorial sent report about the REAMIT Symposium.

BED coordinated work on developing REAMIT Capitalisation project proposal.

### **WP Communication**

The December Newsletter is being finalised and will be published next week.

For the next newsletter, we will change the layout and format to an email template newsletter.

Case studies are being developed as per Ram's request. Sasha will be developing this with the help of Lohit and Gautam.

A Social media training session will be held this week, hosted by Sasha at NTU to enable partners to familiarise themselves with Twitter, LinkedIn, etc. and be more active on social media promoting REAMIT.

**Action for all partners: To provide an update by 18 December on actions from July 2020 RAC/WP/SC meeting.**

**Action: After the social media training partners should be prompted to provide Sasha with their social media details.**

## REAMIT sub-group meeting, 16/12/2020

Attended by Sasha Bennett, Katarzyna Pelc, Gautam Samriya and William Duffy

### WP T1: Pilot Tests

- German pilot tests: There has been a problem with the lorry drivers. They do not want the Gateway to be installed in the lorry drivers' cabin so Marcel will have to deal with this.
- No updates from France
- No updates from UCD
- All pilot test leads will be meeting on Monday (21/12 for WP T1 meeting)
- William having conversation with the team at WD Meats. He wants to create a map of where the meat moves. He will have regularly monthly meetings with WD Meats and the team in the Netherlands. William said they would have to wait to purchase the Clostridium bacteria due to lack of availability of this.
- No updates on Dry Aging or 3D fluorescence trial.

Yumchop interested in trialling REAMIT technologies and want to participate in capitalisation call.

### *Fresh Box Proposal- Gautam Samriya at ITT*

- Gautam explored the Freshbox idea and introduced the Freshbox project. Using recyclable materials, by increasing shelf life of foods. It's a suitable transport solution by reducing waste of fresh produce. They aim to enhance shelf life of fresh produce. Can be used in warehouses and in transportation. Started in 2014 – 2017. Various food testing models were tested.
- Kate: Is this Freshbox technology used in real life? Gautam said yes there were some end users (companies) which used this technology and were successful.
- Kate asked how the sensors communicate the data? They communicate through smartphone application, remote server.
- Freshbox Budget: EUR 1.8m
- More information available on the Freshbox pilot available in the presentation document provided by Gautam.

**Action: Kate to discuss with Ram to present a summary of Freshbox at RAC/WP/RSC meeting in January 2021.**

### WP T2: Big Data Hub

The Big Data Hub installed successfully. Lohit has faced some challenges as they had to reinstall server in a different room. Server is now ready to receive data from pilot tests.

### WP T3: Life Cycle Assessment

- New development from UCD – UCD developed a model for calculation of CO2 emissions to develop the calculations for the Life Cycle assessment of REAMIT technologies.
- Technology readiness & market readiness levels- William will be preparing a presentation on this with the help of his colleagues from the business school at UU.



## WP Communication

- December Newsletter now released
- Video Production plan for 2021 is being finalised to share with the team at RAC/WP/RSC meeting in January 2021.
- Social Media training session took place in December 2021 and went well.
- Ask for feedback at the RAC/RSC Meeting 2020 on communication strategy document.
- Kate is suggesting an elevator pitch video for REAMIT- this can be discussed in the next RAC Meeting.
- Interesting stories and case studies to be featured on the REAMIT website. Suggest Kate to get stories from Yumchop. Present stories online in a meeting with partners. Sasha will send email to partners about collecting stories.

## WP Management

- Invitation sent by Kate for RAC meeting via Eventbrite.
- Kate will request that partners will send out invitation to associate partners.
- Expecting partners' progress reports to be ready before Christmas break. Kate is requesting that partners need to report per deliverable within eMS. Also, to attach under each deliverable, materials they have produced (as appendix).

## WP Long term

- Ram is leading on Capitalisation call proposal so when or if help is needed, they will contact Sasha. Sasha has offered helped.
- Looking for liquid food producer for Capitalisation call.
- Next Meeting for subgroup: Tuesday, 12 January 2020 at 2 pm.
- Action: All partners to register for online meetings in January.

## REAMIT sub-group meeting, 13/01/2021

Attended by: Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar, William Duffy & Gautam Samriya

### WP T1: Pilot Tests

- **German Pilot:** Whysor has no updates from German Pilot tests other than Lorry drivers did not like the idea of Gateway inside trucks, so they have to find alternative solution for the Gateway.
- **Dutch Pilot:** 20 sensors have been configured to detect shock in boxes. Sensors to be stored in Picnic in January 2021.
- Kate has invited Weyers and Picnic to join the RAC/RSC meeting next week, but they have not confirmed their attendance yet.
- French Pilot (University of Nantes): RAMAN Spec experiments with chicken samples from Routhieu. Will be transferring the sensors to STEF trucks transporting food.
- WD Meats: to be installing dry ageing sensors in their chambers but due to COVID there has been some delays.

- William Duffy has spoken to Joan Condell about remuneration on the clostridium trials with Maastricht University so they will need to hire external expertise.
- No change to the 3D fluorescent sensors.
- **Action: William to contact WD meats to invite to RAC/RSC meeting on discussing WPT1**
- **Action: William to request a new state aid declaration from WD Meats.**
- William has had a monthly meeting yesterday and waiting to hear from Dr. James about the training of students for the testing kits.
- William to present an update of the 3 pilots at the RAC Meeting.

*Upcoming pilots:*

- BED pilot test: Frozen food producing company selling food through vending machines.
- University of Nantes are discussing with a company producing eggs.
- Whysor has recruited a new Dutch company producing pork meat.
- There will be other pilots to come in future

**WP T2: University of Bedfordshire Big Data Hub**

- Lohit has been in touch with Davinder at Levstone requesting external connection. Lohit has been talking to another colleague Wayne, from Levstone specialist in Windows op system interface.
- Lohit is requesting for BED ICT to create log in for Levstone and forwarded log in details today. Configure the database and final checks. Wayne went through steps to install the software.
- Newly recruited member of UOB, Joyce to help create log ins and manage the server. Will have to go through same procedures to set up log ins for Levstone.
- Once connection is established, Levstone will use server to develop more Levstone related software.

**WP T3: UU**

- UCD have developed their life cycle assessment approach. Will be discussing this approach for 1 hr in RAC/RSC meeting. They will discuss what data is required from each pilot test partner.
- UCD are recruiting two full time staff and are optimistic things will be looking more positive in 1-2 months i.e. they will have 2 new persons on board working for REAMIT.
- Ulster will provide a presentation on the second day of RAC on technology readiness and market readiness levels. William will be presentation for 30 mins.
- Kate has suggested for William to research and contact Interreg officers to ask which Interreg projects produce technologies at high technology readiness level.

**WP Communication: NTU**

- Case studies have started to be created. The first one developed by the communication team was based around WD Meats.
- Posters are being created around current pilot tests starting with WD Meats.
- January newsletter – requesting information from partners. This matter will be discussed in RAC Meeting on second day.
- Sharepoint - NTU is in charge of appointing the log ins for Sharepoint but some partners need clarity on how to access this online storage space. This will be explained at the RAC meeting.

- NTU have developed a Video Production Plan for 2021 and will be presented to partners very soon.
- **Action: Sasha to send presentation of social media and presentation for RAC meeting.**
- Kate suggests, Sasha to show case study story at the RAC meeting and display the case study to partners.
- The updated Communication strategy will be presented at the RAC meeting – it will be uploaded to Sharepoint for partners to access.

#### **WP Management: BED**

- **Action: Gautam – to send Kate ITT extension budget, finalise reporting in eMS, send an action log from last RAC meeting.**
- **Action: NTU to complete action log from last RAC meeting.**
- **Action Gautam – to clarify the name change from ITT Tralee to MTU.**
- **Action Sasha – send email assigning roles for minute taking in the next RAC Meeting.**

#### **WP Long Term: BED**

- More and more companies are interested in participating in the REAMIT project Capitalisation proposal.
- Ram who is in charge of this proposal, has confirmed it will focus on liquid and frozen food.
- New geographical areas covered in the Capitalisation proposal (Belgium, UK, Ireland).

**Action: Next week, Kate is requesting for help in taking notes. Sasha to organise the note taking. Eleanor at UCD will be in charge of recording the meetings, will be also helping to take notes.**

## REAMIT sub-group meeting, 11/02/2021

Attended by Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar, Gautam Samriya and William Duffy

### WP T1: Pilot Tests

- No news from Imke about Whysor – will be meeting to discuss more on WPT1.
- New pilot test with Yumchop on the way. Identifying the needs of the company with Whysor
- Kate had a meeting with Stefanie Gulotine in B2B Meetings at the last Symposium and also asked Gael from I&R to follow up with Stefanie Gulotine to find new pilot test companies in France.
- A Contact Point person for Luxembourg at Interreg NEW Programme offered to help us find partners companies for pilot tests in Luxembourg.

### Dry Aging Trials

- Gateway and sensors set up, waiting for the go ahead. No dates in mind as no response from WD Meats.

### Clostridium Trials

- Clostridium – still awaiting confirmation from Dr James with the purchase of the new bacteria and the PCR Kit testing with students. William will contact James to try and get some updates on this.
- William says he is trying to get WD Meats to respond, he doesn't want to send emails too often to avoid driving them away. UU are trying to see if there is any work they can do by themselves without involving WD Meats.
- UU partners spoke to a new company last week called Orivo in Ireland to see if there's any potential for a pilot test, but not sure if there is scope within REAMIT for this company

### Update from Gautam – MTU

- Gautam is asking if we have any concrete food quality data to use for some data analysis. Lohit stated University of Nantes can provide this data to be analysed.
- Gautam is preparing a document listing what type of data analysis they will be targeting in the REAMIT project.
- NTU have been involved in contacting potential pilot test partners.
- Kate encouraging us to get in touch with our university's innovation centres and any links to SMEs.

### WP T2: Big Data Hub

- Lohit has received the confirmation from Levstone today that the data has been received. He is requesting Levstone to do a sample data transfer test, but they have advised to directly contact Whysor to transfer data directly to the cloud server. The server is now ready for external access.
- Levstone involved in web app development so they will need a different data time.
- Lohit will set an agenda for the next meeting with Levstone, maybe with all the tech partners or just with Whysor.
- **Action for Kate and Gautam:** Check which pilot test will have food quality data collected (temperature, humidity etc.)

- Kate will discuss with pilot test partners at the WPT1 meeting next week.

#### **WP T3**

- No update from UCD. Hoping to get more updates from them on the meeting next week. No input from Interreg office about technology readiness levels.
- Action for William: to consider having monthly meetings on WPT3 and to consider the content of these meeting.

#### **WP Communication**

- NTU has confirmed the February Newsletter is now published using the new email template
- Videos – NTU is finalising a new video based around WD Meats to be released in February
- Poster – a poster on WD Meats has been developed by NTU with the help of UU and will be approved and published by the end of February 2021.
- Case study currently focusing on WD Meats - next will be Whysor in March 2021.
- Sharepoint- partners now have access to view and upload internal files to the REAMIT sharepoint and are now fully accessing the site.
- Website updates to be done on a weekly basis, Sasha will liaise with PM, Kate.
- Request from Kate to brief partners on what has been updated on the website- and this to be updated continuously.
- Action for Sasha: to Brief subgroup on weekly website updates
- Action for Kate: to discuss with Ram to involve Sasha in WPT1 monthly meetings to get a better overview on the project activities for communication purposes
- Roll up banner section needs to be updated.

#### **Research Papers – REAMIT publications**

- Lohit conducted 4 interviews so far – to be transcribed into text document.
- Lohit has completed 2 transcripts with the help of William.
- Lohit says the purpose of this paper is for checking for the best types of sensors from expert analysis through interviews and research
- 2 research papers are being planned to develop a model for a 'Picnic' like scenario, to look at transporting food through trucks from a fulfilment centre to supermarkets. Looking at food demand constraints and various constraints.
- The models for these papers have been developed.
- Euroma conference to be held in July- paper has been submitted - mathematical model to look at food waste being transported from farm to end user. To capture quality aspects, how food waste reduction would affect the costs and how quality is affected.

#### **WP Long Term**

Tahmina of UOB is preparing a pitch to KTN for Agri-food companies to prepare a 2-minute pitch on technology used in REAMIT, based around food waste.

#### **WP Management**

- Deadline given for notes from RAC meeting – 17 February 2021 (Wednesday)

- Requested Input from partners for extension budget – for 16 February 2021.
- Employed 2 short term contracts for visiting lecturers at BED
- Reporting – need to send payment claims, forecasted expenditure for partners and audited reports by 12 February.

**Next meeting: Wednesday, 24 February 2021, 11 am.**

## REAMIT sub-group meeting, 24/02/2021

Attended by Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar, Gautam Samriya and William Duffy

### WP T1:

- No update from UCD
- No update from France on UON pilot
- Pilot test in Germany, with Weyers has come to an end, the pilot test will no longer continue, no reason given. The team at Whysor have been advised to keep the door open if Weyers decide to return.
- Picnic, The NL: sensors have been installed in the truck, self - configuration did not work, sensors will be sent back to Whysor for reconfiguration.
- Yumchop: UOB is purchasing equipment to be delivered to Whysor. There has been a delay in procurement.
- Clostridium trial: William has finally heard from Mark at WD Meats and research is still happening. There are updates on the type of bacteria needed for the trials. No progress on the pilot test itself.
- Dry ageing trial: talking through the set up the 5 sensors and the Lora Gateway. Creating some documentation for this. They are considering going to another company to purchase sensors, if this can be done quicker elsewhere, they will go ahead. They will look for other companies who will benefit from these LORA-WAN sensors in the meantime to get some data coming in that to wait for WD meats.
- William advised that the WD meats poster is not yet approved by WD meats, Kate urges William to contact WD meats and will speak to the team before publishing this poster.
- Gautam discussed that they require data from environmental data to be analysed. This will be discussed at the next WPT1 meeting. Kate requesting for Gautam to send an email to WPT1 Leaders to explain what type of data he requires, ahead of the meeting.

### WP T2: University of Bedfordshire Big Data Hub

- Lohit had another meeting with Whysor to come up with new architecture to transfer data. Tom from Whysor will be sending them a script on how to transfer the data from Whysor's Cloud to the Big Data Server. Lohit will initiate the request for Gautam to access the server.
- Tahmina suggested for Gautam to install some software to access data analytics function in the Bedfordshire server.
- One challenge they are facing is creating multiple user access and database now. It is creating a problem having multiple accounts. Need to purchase additional license to have more users. User access to Levstone is fine and up and running until they can sort the parallel connection issue, they will allocate time slots for each partner.
- Kate suggests now would be a good time to schedule the WPT2 Meetings, around once a month.

### WP T3 UCD

- No update from UCD.

- William's idea to start meeting more regularly has been supported by Ram. William will be organising the first meeting in the next 2 weeks to arrange a meeting to discuss WPT3. Sasha will attend WPT3 meetings.
- Kate advised, we need to have more advanced prototypes of the various technologies to show how we can sell these technologies to the market. We are not yet at this stage but this needs to be discussed.

#### **WP Communication**

- WD Meats Case Study: Usha will be sending a revised document at the end of the month. This has been developed.
- WD Meats Video will be sent by Sasha this week to be reviewed before publishing.
- Website updates to be carried out. Kate and Sasha to meet after meeting to discuss website updates in more detail.
- Lohit mentioned EUROMA paper will be published before end of April 2021.

#### **WP Management**

- FLC auditors will start audit of REAMIT progress report on 11 March.
- Ulster need to submit progress report by 5 March in time to include it in the REAMIT project progress report.
- Kate is collecting input from partners their budgets during 12-months project extension. The JS should approve it at a meeting in late March.
- Notes from RAC/WP/RSC online meetings in January 2021: Sasha and Lohit to forward to Kate and Gautam their notes. Gautam is currently compiling the notes.
- Levstone, Senx and UCD have not yet submitted progress reports and extension budgets.

#### **WP Long Term**

- No updates.
- No discussion regarding December 2021 Symposium.
- Tahmina submitted REAMIT pitch at KTN.

**10 March 2021 date set or the next meeting.**

## **REAMIT sub-group meeting, 10/03/2021**

**Attended by Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar, Gautam Samriya and William Duffy**

#### **WPT1 – Pilot Tests**

- No news from Picnic, UCD, or UON on their pilots.
- Weyers has stopped their pilot with Whysor - no reason has been given.
- Yumchop: Purchase of sensors for Yumchop – Kate is working with Imke on the purchase of sensors. Kate needs to ask for 3 quotes from 3 different suppliers as well as for information regarding warranty



and insurance of equipment during transit. UOB cannot proceed with the purchase without input from these companies. Kate has been chasing these companies.

- Clostridium Bacteria trial – internal meetings have gone ahead to discuss growing CB at Ulster’s lab. It will take up to 12 weeks for the clostridium bacteria to grow so it will be too risky to grow it by UU team by themselves. Ulster will have to buy this bacterium in order to work on it.
- Dry aging trial- William still working on these sensors. Waiting for them to be configured by Tom at Whysor. The documentation about sensors is also now ready.
- 3D Fluorescence: Matthias from Fresh Detect (FD) in Germany lent Ulster two 3D fluorescence sensors. In the loan agreement between Ulster and FD, no date was specified as to when sensors would need to be returned to FD. Ulster expects they would be able to use sensors until end of the REAMIT project. Ulster hoped that with 3D fluorescence sensors they would get some data on food quality, but it is not the case. William knows how to operate these 3D fluorescence sensors. However, they are not giving data you would expect. William discussed it with Professor James. James wants to have both sensors delivered to Cloraine Campus at Ulster, where the microbiology lab is located, to validate data from sensors at that campus. William would prefer not to leave sensors at Cloraine Campus (value of each sensor can be as much as EUR 4000). Coleraine lab – as well as the campus at UU – will reopen on 1 April 2021, and William expects he will be able to go there in person and take good care of the sensors.

#### **New pilot tests in REAMIT**

- UU is contacting other companies such as seed producers, liquid food companies in Northern Ireland, to involve them in REAMIT pilot tests. This is to secure another pilot test, in case there is little progress (in work and communication) on pilot tests with WD Meats.
- NTU have been having meetings with potential pilot test partners.
- Kate has approached two Contact Point Persons for Germany (<https://www.nweurope.eu/contact-us/contact-points/>) asking for help with finding a new pilot partner in Germany.
- At KTN online event (Food Industry Innovation 2021, on 3 March 2021) focused on agri-food and innovation, Kate met with a contact at Unilever. She talked about potential pilot test with Unilever and the contact seems interested and Kate will keep in touch.
- Lohit reiterated that the potential pilot company for NTU had a meeting with them and Usha, with a tech company with contacts at a brewery.
- Kate suggested to document on monthly basis the progress in each pilot test. Sasha and Lohit agreed this is a good idea. The challenges with COVID is that the progress is very slow at this time.
- The next work package T1 meeting with Gael will be next Monday

#### **WPT2 Big Data Hub**

- Lohit is awaiting responses from WPT2 Meeting invitation- this will be arranged soon.
- In the next meeting, they are going to modify the script to transfer the historical data from their server to UOB Data hub server.
- The next focus is for real time data to be repositied to the server.
- Lohit has now initiated the request for a remote user access for Gautam. They have scheduled meeting with Gautam to test the access to server.
- Since last month, they have requested home working for Lohit and Joy, to allow them to work on the Big Data Server from home.

- The team at Whysor has tested the data to be transferred from Whysor cloud but not yet
- University of Nantes had a temporary solution to transfer data.
- Gautam approached Kate to find what kind of data was being collected in pilot test, looking specifically at food quality data. Gautam has been speaking to Kate and Ram about how to collect this data. Kate suggested we can discuss how the data is collected for each pilot test and prepare a table of this information.
- Gautam has prepared a document suggesting other data that can be collected in a feasible manner. i.e food quality data. A draft has been shared on REAMIT SharePoint.
- Will be discussed in the next WPT1 meeting with the other pilot partners to get their opinions and suggestions on how to develop this further.

**Action for Lohit:** Ask Joy to send Windows user account and database client setup procedure document to Gautam

#### **WPT3 UCD**

- William is considering having a roadmap written for WPT3. Kate said this would be helpful in the development of this to get more ideas but the difficulty is that the pilots are not running as planned.
- First meeting of WP T3 will be on 22 March at 11 am to discuss this further.

#### **WP Communication**

- WD Meats video – no longer to be published, along with poster and other communication around WD Meat. These have been removed from online website.
- Picnic Poster – being developed with Imke at Whysor along with video to be completed by end of March.
- Website updates were discussed and will need actioning.
- Kate suggests having a WP Communication meeting with 1 rep from each partner – to make one communication action with local media. Kate suggests Sasha can use the ‘action plan’ document as guideline to have partners input. Give partners a ready to go roadmap of steps. These guidelines will save them time. Different communication tools will be used: storyboard, interviews, testimonials, videos, articles.
- 1 communication objective to promote REAMIT to local actors- to hopefully find local actors. We can ask partners to help.
- **Action for Sasha:** Discuss with Usha to organise a WP communication meeting. – suggested monthly? Every 2 months?
- Weekly reminders are being sent to partners to remind them of social media interaction– partners aren’t responding so monthly meetings would be the next type of suitable action.
- REAMIT project website – Sasha and Kate previously discussed making this a separate website using the current [www.reamit.eu](http://www.reamit.eu) domain already purchased. Ram questioned the relevance of having another website in parallel. We brainstormed about the possible advantages offered by having a new website (outside Interreg NWE Programme) and came up with the following: more creative, freedom to create/include materials that we want, better and more attractive layout (for marketing purposes) as layout in Interreg website is restricted to text and images only, you can embed things better, you have full control of the website, you can use animated images, Interreg website would be the landing site.

- Sasha to prepare a few examples to show at the next meeting, this discussion can be continued with Ram, Kate and Usha.
- Web updates to be completed: events to be updated, videos to be removed from homepage.

#### **WP Management**

- Audits of REAMIT progress report will begin at BED this week. Unfortunately, payment claim from UCD would not be included in the current progress report.
- Kate said that the LP has still not received input from all partners on 12-month REAMIT extension budget.
- Minutes from RAC/WP/RSC meetings in January 2021 will be finalised in the next 2 weeks. Sasha will send her notes to Gautam.
- 2 new staff members have joined REAMIT team at BED (visiting lecture contracts) with possibility of extending their 6-month contracts, to help with REAMIT implementation (research and Big Data analytics).
- Kate has attended two events focused on agri food sector, organised by Innovate UK and KTN. She would share KTN newsletters with information about upcoming events.
- Kate suggested reorganisation of SharePoint to correspond with REAMIT Work Packages order.
- **Action for Sasha:** For navigation purposes reconsider rearranging SharePoint folders.
- **Action for Sasha and Usha:** for reporting in eMS, follow the deliverables structure, especially for WP Communication

#### **WP Long Term**

- Tahmina was not successful in the academic pitch competition at the KTN event, focussed on food related research.
- The KTN event highlights how we can be attractive to investors, especially relating to WPT3 regarding technology readiness. REAMIT may increase its visibility have.g. Through a new website, REAMIT tool-box.
- **Action for Kate:** Share link for KTN events and Innovate UK events.
- UK has now exited the EU, UK will not be able to lead on another Interreg NEW project or easily participate as partners in future projects funded by Interreg NWE Programme.

**Next meeting: 24 March 2021 at 11 am.**

## REAMIT sub-group meeting, 14/04/2021

Attended by Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar, Gautam Samriya and William Duffy

### WP T1: Pilot tests

- No updates from other pilot tests including Whysor, UON and UCD.
- Kate has advised UOB are restricted with purchasing sensor equipment for Yumchop, Imke will step in to help with this as Whysor is a client of these sensor companies being used for Yumchop.
- The brewery company found by NTU is concerned about ownership of data and access to raw data. They expressed their concerns and we presented this to Interreg's Joint Secretariat. Kate will send to all partners REAMIT non-disclosure agreements template for feedback.
- William has not been able to access his email account to the university server issues, so he doesn't know if there have been any updates from WD Meats. UCD still also have not been able to go on campus to see if they have usable clostridium bacteria there, due to their local lockdown.
- William is having a meeting today with a company called Musgrave, Cash and Carry to discuss potential pilot test.
- 3D Fluorescence Sensors from Matthias – William was not able to go to university yet to test these two 3D Fluorescence sensors.
- In March 2020 – Matthias Bruner from Tsenso, agreed to send to UU 30 sensors temperature monitoring; the idea was to track food all the way, from when it was packaged, to determine 'life cycle' of the food. However, Matthias disappeared during Covid. At that time, Ulster wanted to use these sensors with Dunbia. Ulster had no news since then from Matthias.
- Munster Tech Uni is not approaching any new pilot test right now, advised by Gautam.
- Sasha mentioned NTU have heard from TTK Confectionery who are interested in pilot testing. A dessert/chocolate company based in Nottingham. Looking for a solution for the detection of allergens and allergen control, as well as temperature control. They would like to meet and discuss how REAMIT can help them.
- Kate has contacted KTN contact who has a list of agri-food companies in UK. Kate has been contacting various companies such as Unilever for future pilot tests but finding it difficult to contact. BED will meet with Unilever next week to discuss potential for a new pilot test.
- **Action: William to follow up with Musgrave.**
- **Action: Kate to follow up with Unilever**
- **Action: Kate to follow up with her contact at KTN on developing new pilot tests.**
- **Action: Gautam to discuss with Ger and Pat if they can identify potential food company for a pilot test (when they are ready) through Enterprise Ireland.**
- **Action: Sasha to follow up with TTK Confectionery. Kate, will follow up with Ram and Ali (from UoN) on the detection of food allergens.**
- **Action: William to follow up with Professor James on how to determine food quality.**

### WP T2 Big Data Hub

- Transferring remaining data from the Whysor cloud to Bedfordshire cloud. Yet to discuss with Tom at Whysor about to transfer of remaining data. There is a meeting on Friday, 23 April 2021 on WP T2. Would like to discuss data requirements for UCD.

#### **WP T3 UCD**

- No news from UCD regarding the Life Cycle Assessment.
- William says he will send out a doodle poll for the next meeting.
- William says it will be useful to have UCD on board and attending to WP T3 meeting as they are very important members of WPT3. William will arrange the meeting around their availability.

#### **WP Management**

- All notes have been compiled by Gautam. Minutes are being reviewed by Kate this week.
- BED is expecting a payment from JS in the next couple of weeks. All reports have been cleared with no issues.
- Kate has almost finalised the work on the REAMIT project extension budget. Received input from all partners but one, assuming they don't need any extra finances.
- Kate will prepare the next REAMIT meetings hosted by UU in July, most likely online.
- Lohit has resigned and will be moving to a research institution in India. Will be in REAMIT until 22 June 2021. The work on recruiting Lohit's replacement is underway.

#### **WP Communication**

- Whysor pilot with Picnic: Poster and Video have both been developed by NTU. Input from Lohit and Lakshmi has been received, Imke has now reviewed this information and Sasha will be working on finalising these documents.
- UoN' pilot poster and video are in production. Sasha met with Ali to discuss the case study with UON and Routhiau.
- Communication actions by European partners – Sasha met online with Imke from Whysor and Ali at UoN to discuss their communication actions and suggested new methods of communication – the meetings were well received and successful.
- Sasha provided an update on creation of a new website for REAMIT. Kate suggested to approach the owners these 4 websites to understand why they used a separate website. Also, to understand why they have not included the logo of Interreg NEW Programme on their new website. Kate also suggested to ask what their ambitions are for the separate websites. Kate suggests arranging phone calls with these 4 project managers.
- The first draft of the newsletter will be ready to circulate soon, received input from some partners but awaiting final content from some partners. Newsletter to be published at the end of April.
- Sasha is requesting input for more articles in the newsletter – Sasha will email Gael for 10 minutes in the WP T1 meeting to provide a 10-minute session on WP Communication.
- Kate asked Gautam if he will be discussing the Data Requirements document in the next meeting of WP T1, particularly to discuss with Ali at the UoN. Ali will need to confirm if he is available to meet on 23 April.

**Next meeting date: Wednesday, 5 May 2021, at 11 am.**

## REAMIT sub-group meeting, 5/05/2021

Attended by Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar, Gautam Samriya, James Gillespie, and William Duffy

Opening comments: James Gillespie will be taking over William Duffy's role at Ulster University from 20 May 2021. James is not starting officially on REAMIT until 1 July but will try and attend some meetings.

### WP T1: pilot tests

- Whysor
  - current sensors do not properly detect shock but will detect other parameters.
  - Imke and Marcel travelled to Luxembourg to a new pilot company.
- UCD
  - UCD will be employing 2 full time members committed to REAMIT.
- UoN
  - UoN is currently developing pilot with Igreca – egg company.
  - Ali is still working on fruits, oranges and apples but still no company to work with.
- UOB
  - Kate has received a confirmation from procurement and finance to carry out the procurement process to purchase equipment for pilot test with Yumchop.
  - Unilever (big food producing company from UK) have expressed interest in the REAMIT approach and technology. BED met online with staff member from Unilever to discuss possibilities for cooperation.
- NTU
  - NTU met with a new potential pilot company called TTK Confectionery, a chocolate supplier based in Nottingham, UK. The online meeting went well, and the company confirmed they were interested in allergen detection in food.
- UU trying to contact WD Meats as they have not heard from them since March-2021. William is concerned that there is no contact with WD Meats so this has now been escalated to Joan to get a response from WD Meats.
- UU:
  - James Dooley is now ready to start the swabs for clostridium. The DNA extraction kits are now ready, just waiting for WD Meats to respond.
  - William is talking to James Dooley about procurement of the bacteria, he has not received anything from UCD but they will continue contacting other companies.
  - Musgrave are happy to start a pilot with UU, they have local delivery vans around Belfast which have no temperature monitors. UU will install temperature and humidity sensors. Some kind of alerting system will alert them if the chiller in the van isn't functioning well. They also have lorries, but these have temperature sensors installed.
  - Kate asked if WD Meats has reopened but as they have not been responsive with UU, it will be difficult to arrange a site visit.
  - Kate has followed up with KTN regarding new companies for pilot tests in UK, but no response received.

- **Action: William to discuss with James about how to detect food quality.**

#### MTU

- Gautam has discussed with Pat and Gerard and they would like to discuss with Kate further to talk about liaising with Enterprise Ireland. Kate suggesting for Gautam and team to develop this new pilot test and arrange a meeting by the end of June.
- Gautam has discussed with William, Ali and others on the development of the data requirements document. He has spoken with Tom and Imke at Whysor and had positive input. Data requirements for Picnic have been decided, for example, food score index seems to be a suitable method of analysis. Gautam has shared a table that he has developed with Whysor and Picnic on their data requirements in detail.
- Gautam is requesting William to discuss with WD Meats about their data requirements.
- **Actions: Tom and Imke to discuss with Picnic, William to discuss with WD Meats on their specific data requirements.**
- **Action: Gautam to keep updating this document and upload on shared drive.**
- **Action: Gautam to have 1-1 meetings with pilot test leads to understand their requirements.**
- **Action: Kate to meet with Gautam to understand the document better.**

#### WP T2 Big Data Hub

- Still waiting on the licensing to be approved.
- Waiting on providing access to Senx.
- Gautam had problems accessing the server, but this has now been sorted between Lohit and Joy.
- Imke from Whysor has expressed the communication on WPT2 needs to be improved. Lohit has asked if this can be forwarded to him to make him aware of where the disparities are.
- Kate expressed to Gautam that she thought some partners did not understand the data requirements at the last WPT1 Meeting.
- The next meeting on WPT2 Meeting is upcoming on 18 May. Allow access to Senx
- Lohit: Follow up with Tom at Whysor on the data transfer.

#### WPT3

- Meeting will take place on 12 May at 3 pm, facilitated by William. The team at UU will break down the deliverables. Fionnuala should be attending.

#### WP Management

- Not heard from 1 partner for extension so Kate currently stuck with this.
- Payment from LP to PPs has not been actioned yet.
- As Lohit is leaving, BED have advertised the new position (27/05/2021 application deadline).

#### WP Communication

- April 2021 Newsletter is now published – partners to share it on social media.
- Case study is being developed on Routhiau company – collaborating with UON on pilot test. NTU will need input from partners to develop this case study.
- Sasha is contacting 2 external Interreg projects for their advice and reasoning behind setting up a separate website for their project. Kate will send justification document to JS.

- **Action: Local Communication channels table to be updated by partners – Sasha will send to partners.**
- Video for Picnic: Sasha to send justification document to Imke at Whysor to request permission from Picnic to publish this video. The drafts of the video are currently being reviewed.

**WP Long Term**

- Kate and Ram will present REAMIT at the upcoming event in May 2021: Interreg NWE Programme impact event.

Next meeting is: Tuesday, 18 May 2021 at 2 pm.



## REAMIT sub-group meeting, 18/05/2021

Attended by Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar, Gautam Samriya, James Gillespie, Tamiris Da Costa, Xavier Cama and William Duffy.

### WP T1: Pilot tests

Running pilot tests:

- Picnic (NL) – Whysor are going ahead with the pilot test. The current sensors don't detect shock so Whysor will need to figure out a new solution.
- UON pilot with Routhiau (France) – No updates from Ali.
- UoN pilot with IGRECA egg company (France) – UoN are going ahead with this pilot test.
- WD Meats (UK) – Ulster are waiting to hear from WD Meats before they purchase equipment for DNA extraction. UCD did not confirm if they have bacteria available for UU. Kate has offered that BED can help Ulster purchase Clostridium Bacteria from elsewhere.
- Yumchop (UK) – equipment has been purchased by BED and shipped to Whysor for configuration.

New pilot tests:

- Update on Biogros (Luxembourg) – want to go ahead with the pilot test.
- No news from Unilever (UK).
- Kate had a discussion with a doctor from the Human Milk Foundation (HMF), UK managing breast milk bank, offering milk to premature babies. HMF are interested in participating in REAMIT pilot test.
- Kate and Ram will meet with Pat, Gerald and Gautam from MTU to discuss a new pilot test in Ireland.
- Xavier will be developing a pilot for UCD in June. Xavier's PHD focused on a specific type of spectroscopy looking at compound of some minerals.
- Kate requested Gael and Blandine from Valorial to develop a new pilot test in France.
- Kate has been in contact with German contact person at Interreg NEW Programme to help us find a pilot partner company in Germany. No luck so far.
- Kate has approached the LP of HappyMoo project (funded by Interreg NWE Programme) to help us find a pilot partner company in Germany.

Other points:

- Lohit advised William that French pilots do not have temperature sensors, but Picnic have temperature sensors, so these can be easily adapted to UU sensors. William can speak to Levstone to develop this further.
- Ram is thinking about closing the recruitment of pilot tests at the end of July 2021 and shifting the focus to WP T2. James Gillespie suggests the end of July may be too ambitious as Ulster are currently developing new pilot tests so it will be difficult for UU and other partners to get all pilots up and running by end of July. Kate suggests it will be good to keep the window open for new pilots to attend also beyond July 2021. This will be further discussed at RAC/WP/RSC meeting on 7-8 July 2021.

## **WP T2 Big Data Hub**

- Lohit is currently working on transferring the data from the UON pilot to Bedfordshire server.
- Lohit had a few meetings with partners at Levstone, MTU, Whysor, and BED.
- Tom is working on script and will be implementing this in a few weeks. William can also try to reach out to Levstone to get the data from their sensors through Levstone's app.
- Licensing still needs to be completed. This will allow access to external contacts at different partners. Waiting to receive quotations for this.
- The way in which data is stored within the server will need to be reviewed so data does not get duplicated.
- SQL Script will be executed by Joy and Lohit. If they have access, partners will be able to access this script.
- Data requirements were discussed by Gautam in 1-1 meetings with partners. Various data points of interest were discussed. A good data point suggested by Tom was wastage of ice. Picnic will be interested in this and it will be a good indicator for them. Next step is to discuss with pilot test companies on what their specific data requirements and data points are.
- Quantifying food quality using food score index for Picnic. Tom and Imke will need to discuss with Picnic on quantifying the food quality data.

## **WPT3 Business development of REAMIT technologies**

- William said we need to understand what kind of food waste problems they are happening in Northern Ireland.
- Lohit mentioned in the last meeting they were discussing the terminology used describing REAMIT technologies. We will need to decide on the names of these technologies, to determine what REAMIT will be offering as products on the market. E.g single sensors or a group of sensors to be provided.
- Tamiris will be working on Life Cycle Assessment. She will be meeting with pilot test leads to discuss this individually for each pilot test. The food quality and weight of the food wasted, are some of the parameters that will need to be analyzed in the LCA analysis. Temperature and humidity sensors are not providing sufficient data for their assessment.

## **WP Management**

- RAC Meeting to be hosted by NTU. Invitations to be sent within a week.
- 5<sup>th</sup> round of REAMIT report to open soon. Kate will send an email about it shortly asking partners to 'book' their FLC auditors.
- Kate had no feedback yet from the REAMIT officer at JS regarding the REAMIT 12-months extension budget.
- Kate advised new colleagues to look at the REAMIT Application Form, available at Sharepoint.
- **Action: Sasha to grant access to SharePoint to Tamiris, Xavier and James.**

## **WP Communication**

- WP Communication meeting took place alongside the WP T1 meeting, delivered by NTU. Partners provided some input and Kate suggested a template should be provided to partners to help with their communication activities.
- Next steps will be to produce a video on the UoN pilot with Routhiau.

- Case Study on Routhiau is currently being developed by NTU. NTU will need input from UON and other partners.
- Website justification document has been sent to JS.
- Website updates – a new subscription form has been added to the website. Kate says this is fine, maybe change the position on webpage and move it higher.

**Date for next meeting – Thursday 3 June, 11am – 12.00 noon.**

## REAMIT sub-group meeting, 3/06/2021

Attended by Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar, Gautam Samriya, James Gillespie, Tamiris Da Costa and Xavier Cama.

### WP T1 Pilot tests

- Whysor pilot test with Picnic (NL) – Whysor was planning to go ahead with installation of sensors in Picnic's e-trucks. The sensors would measure temperature and humidity inside food boxes. They would not measure shock detection. Imke from Whysor informed LP early June via email that Whysor has not been able to get in touch with Picnic in the last couple of weeks to agree on when sensors would be installed in Picnic trucks.
- Whysor pilot test with Biogros (NL) – No updates on this pilot test, other than following Whysor's visit at the company's sites in May-2021, the company was very interested in participating in the REAMIT pilot test.
- The UoN pilot with Routhiau (France) – No updates from Ali on progress in taking this pilot test out of the lab environment, and installation of sensors in STEF trucks.
- UoN pilot with IGRECA egg company (France) – No updates from Ali other than they are going ahead with this pilot test.
- Kate had a positive answer from Human Milk Foundation (UK) managing breast milk bank, offering milk to premature babies. They seem interested in participating in REAMIT pilot test. Two online meetings took place with the HMF and one with Whysor. Next steps have been agreed for Whysor to specify which Whysor's sensors would be lent and shipped to HMF in the next weeks; and for HMF to identify to donors (mothers expressing milk at home) who will participate in the pilot test.
- WD Meats (UK) – Sensor Clostridium Estertheticum. The meeting between UU and WD Meats (end of May) was canceled and James is trying to reschedule it. James will try to establish whether they are in or out of the pilot test with Ulster. James will confirm if the bacteria will be taken from UCD or whether another source should be explored. According to James, this bacterium is hard to locate elsewhere (outside UCD), it takes a long time to grow and from what he knows, UCD may be the only supplier in Ireland.
- Pilot test with Glen Affric and University of Liverpool – they emailed NTU and BED saying they were interested in developing a REAMIT pilot test, but they needed to postpone this work at least until July 2021.
- William has started discussing a new pilot test with the company called Musgrave. James had a call with them on Tuesday (1/06/2021). They said they have busy periods, but they will be freer from 19/07/2021. William ordered one sensor and they will develop their own bespoke application to connect the sensor to the REAMIT cloud. James said that there is a partner in the project with software developers, but he believes that it might be easier for the Ulster team to try to develop this initial application for the sensors. He also said that Ulster team (Daniel and Brian) has background in development. The sensors will be installed in delivery vans. They also have refrigerated trucks, that already have such equipment. The delivery model is in Belfast area from the warehouse to various outlets and fast food restaurants. They distribute meat, fruit and vegetables in boxes.

- James is also having exploratory calls with a number of companies in Ireland at the moment. To date, the companies that have been surveyed are: Galvia, Riverwest Management, Finnebrogue, NHS, Aurivo, Dale Farm, Kepak, Hendersons Group, and Musgrave.
- Xavier said that Shane contacted Carston group, because he has been already a point of contact with them in the past, but he hasn't any updates. Kate suggested that if Carston Group does not respond positively, it is important to approach other companies and the good way to do it is through the contact person for Ireland, Sarah Davoren, because she is working with different projects and companies in IE and may be able to help.

**Action for Kate: to share with UCD colleagues the name and contact details of the Interreg NWE Programme Contact Point person for Ireland.**

- Kate received an e-mail from Unilever and they decided not get involved in the REAMIT pilot test because they do not have much wasted fresh food during, so this is not really an issue for them.
- Kate have met with Pat, Gerald and Gautam to discuss a new pilot in Ireland. Gautam suggested to replicate the same kind of pilot in different countries or focus on different products like fruit, vegetables or meat or online supermarkets and meat producing company.

**Action for Gautam: to report about the progress in approaching companies in IE for a pilot test.**

- Sasha did not have any updates about T.K. Confectionary Company. She had called them a few times about a month ago. But she is not sure if they are still interested, because she has not heard anything.
- Kate said that we will probably continue recruiting new companies for REAMIT pilot tests until the end of 2021, however this issue will be discussed at RSC meeting in July 2021.

#### **WP T2 Big Data Hub**

- Lohit gave access to the database and created a secured instance for company Senex, which confirmed that they were able to access. Lohit was also involved in the last two weeks with the licensing. He received the courts about additional licenses that he wasn't planning to purchase external access to the server. But before finalizing these quotations, he requested a meeting with the software provider on Friday (4 June).
- According to Lohit, if we opt for an unlimited kind of access by all partners, then the price goes up to nine thousand pounds. But if we don't require this unlimited kind of access, if we need only about 20 to 30 users, then it may be slightly above one thousand pounds or even less.
- Lohit believes that the limited access would be more appropriate if only the REAMIT partners want to access the database. But if REAMIT goes for an open software in the future, where many numbers of users would log into a mobile app or use a mobile app on their own phones, i.e. the number of users increases drastically, maybe unlimited access would be a better solution and would have no legal issues for the project.
- To take this decision, Lohit want to have a couple clarifications with the software provider.

**Action for Lohit: to obtain clarifications from software providers to enable a decision at BED on unlimited or limited access.**

- Lohit is also working on the creation of a shared instance on the server. This is to allow access to the data for all the other partners. The shared instance would be accessed by all the external partners and they would be able to download the data from the shared instance. He will be doing this action in the next two weeks.

#### **WP T3 Business development of REAMIT technologies**

- Tamiris is working on Life Cycle Assessment data requirement. Her idea is to have individual meetings with each pilot leader to discuss each pilot test and the data required for the LCA. She is preparing a general questionnaire to give an overview about the data needed and then the questionnaire will be adapted to each pilot.
- According to Tamiris, it is possible to add lines and include all the needed input and output flows in the questionnaire elaborated. For example, raw materials used in the process, packaging materials, waste streams.
- The questioners are not completed, she included the questions to assess the current scenario, but she still has to include the information needed to estimate the impact of pilot's installation.
- In addition, she is also focused in developing deliverable 1.1 related to the systematic review of the technical and business landscape of fresh products. She is collecting data regarding the amount of waste generated in different supply chains and where in the supply chain it becomes waste.

**Action for Kate: to request Gael from I&R to allocate 15 min to Tamiris for presenting the questionnaire for LCA to leads of pilot tests.**

#### **WP Communication**

- Sasha talked about the new website development. A separate standalone website to the main INTERREG project page was proposed. Sasha sent a proposal to the Joint Secretariat for Interreg NWE Programme, Matthew Thompson. The response from the JS was that they don't usually approve of having separate websites, unless this is included in the original application form. Sasha confirmed that this was included in the original application and there is budget for website development. It was decided to go ahead with having a separate website because we will be able to customize and have a more creative freedom than just using the same INTERREG site on the Internet site, which is very limited. According to Sasha, Interreg site is very structured, there's very limited scope for any changes and is not very user friendly.
- Sasha is working on the purchasing before the end of this financial period (30/06/2021). Sasha is planning to have this website live for the next four years, until the end of the project (which is ending in 2023) and also for an additional two years from that date. The website platforms cost is roughly about 15 pounds per month to manage and to keep the domain active. Therefore, about seven hundred and twenty pounds will be spent for that period.
- Sasha sent a communication template to the partners to encourage them to make at least two communication within the next few months. Ram had approved the template and Sasha sent it to the partners that have pilot tests currently running because those are the partners that would have more updates currently. According to Sasha, Gael is currently working on a draft to post on their social media platforms. For the French partners, Gael is proposing to translate this in French so that it will be more relevant to their local channels.

- In terms of the videos, the last video that was developed was the picnic one. One issue that is being faced is that a majority of the pilot parties don't want to be named publicly. Kate suggested to prepare the communications generically, mentioning e.g. a meat producer in Northern Ireland or a food manufacturer.

**Action for Sasha: to support partners in producing at least one communication action by partner by the end of June 2021.**

#### **WP Management**

- Kate received feedback from JS about the project's 12-month extension budget and needs to provide some justifications for some cost categories; particularly, for any cost that is not staff cost or overhead cost.
- Regarding the financial reporting, Kate requested that all partners start working on it now because it takes time (only three to four weeks for auditors to do the first level control) and we have strict deadlines.
- RAC/WP/RSC online meeting will take place on 7-8 July 2021. It will be hosted by partners from NTU.
- All pilot test leads are responsible for inviting pilot test companies to attend WP T1 meeting (during RAC/WP/RSC meeting) to present the pilot test.
- Interviews for Lohit's replacement will take place in BED on 18/06/2021.

**Action for James: to invite WD Meats to RAC/WP/RSC meeting to join the discussion on pilot tests (WP T1 meeting on 7/07/2021).**

**Action for Tamiris and Xavier: to discuss with Fionnuala the calendar for UCD report, including FLC audit and financial report.**

**Action for Tamiris and Xavier: to discuss with Shane and Fionnuala the plan for the next REAMIT symposium (December 2021) hosted by UCD.**

**Date for next meeting – Thursday, 17 June, 11am – 12.00 pm.**

## REAMIT sub-group meeting, 17/06/2021

Attended by Katarzyna Pelc, Sasha Bennett, Lohithaksha Maiyar, William Duffy, Tamiris Da Costa and Xavier Cama.

Apologies: James Gillespie

### WP T1 Pilot tests

- Whysor pilot test with Picnic (NL) – There has not been an update on the Picnic pilot test. Pending meeting on Monday, 21 June (WP T1 monthly meeting) as Whysor may be able to provide details on it.
- Whysor pilot test with Biogros (NL) – To date, no update received regarding pilot test with Biogros.
- BED pilot with Yumchop (UK) – all equipment has been purchased. Sensors currently at Whysor site for configuration. Yumchop confirmed attendance to the REAMIT meeting in July.
- BED pilot Human Milk Foundation (for briefness HMF will be used in this document) – HMF expressed their consent for their name to be used in REAMIT communication actions. Two online meetings with BED and HMF took place in May 2021. Whysor attended the second meeting and advised about sensors and the plan for this pilot test. Whysor offered to lend two of its own sensors to HMF to start this pilot test immediately, before purchasing more sensors (about 50 sensors will need to be purchased by BED).
- T.K. Confectionary pilot - no update received by NTU from T.K. Confectionary.
- Ulster University pilots with WD meats – WD meats have been responsive lately (it was raised on the previous meeting that a meeting with them had been cancelled).
  - Dry-aging trial: WD meats gave their approval to go ahead and install the sensors.
  - Clostridium bacteria: Possibly due to corona and related extra hygiene measures, very little clostridium has been detected at WD meats, but that could change as activity goes back to pre-pandemic standards. They want to freeze sample swabs in order to study them. They normally send swabs to a company in England for analysis.  
 Clostridium from UCD: UCD stated that they had Clostridium available and they were able to share it with Ulster University. William has not heard from them recently, though.  
 Communication with WD meats is taking place at the moment. Further liaison with them will be carried out when James is back.
- UU's pilots with NHS – confirmation on involvement with REAMIT was given. At present, the pilot is still vague and details on pilot design have not been fully agreed yet. However, they expressed their interest in joining the project as they have food stuff that has to be consumed within 24 hours and food waste does occur. A meeting is scheduled for next week to discuss pilots.
- UU's pilots with Musgrave – as of now, pilot would include a standard design with temperature sensors. James and William are working on delivering a simple app for them to work with. The APP would be ready by end of August. The pilot test can start only when the APP is ready.

**Action for William/James: to contact LEVSTONE to discuss compatibility of their app and utilize it if appropriate for this pilot.**



- UCD pilot – no updates on the UCD pilot other than work is being carried out at the moment to agree on a course of action - Xavier to agree on a pilot plan with Shane before the end of the month, they have agreed on a meeting next week. IT Tralee and UCD had a meeting on the 14<sup>th</sup> of June for enhancing collaboration and to discuss UCD pilot. Pilot being discussed to revolve around the development of a box/container with sensors (temperature, location) and CyberBar implementation. Xavier to send an email to Kate about possibility of importing (part of) Picnic approach.

**Action for Xavier: to prepare a presentation on what the pilot is going to look like according to the plan and considering Shane's feedback and to present it in July.**

- IT Tralee (Munster Technological University) – confirmed that they were going to conduct a pilot. Gautam had informed they were working on it.
- Whysor pilot being discussed with the slaughterhouse: Imke had informed there was no update yet.
- Pilot test with Glen Affric and University of Liverpool – Sasha has been trying to contact them. Given their latest response, the start of the pilot may be delayed until the end of July due to ongoing operations/construction at their facilities.
- Other pilots being discussed at the moment have no updates, but the WPT1 meeting on Monday, 21 June, may give some more detail.

#### **WPT2 Big Data Hub**

- Lohit informed that he had received the required information to grant access to the database from all partners. Partners to be provided access to the shared instances and the dedicated instances accordingly - SQL login usernames and passwords will be provided to partners in due course.
- As per licensing of users, Lohit addressed some questions (to the software provide?) but he has not received a response yet to be able to come with a decision (Lohit expressed that he hoped this could be arrange before his last day).
- Lohit was encouraging partners to test their access to the database as soon as possible. Lohit will be meeting Kate to test access.
- Lohit will delete his instance before leaving as 22 June is his last day.
- Clarification on tasks/colours: different colours mean the tasks are related - they have been assigned a colour to indicate that they belong to the same type of task.

**Action for Lohit: pending clarifications to enable a decision at BED on unlimited or limited access.**

#### **WP T3 Business development of REAMIT technologies**

- UCD – as for deliverable 1.1., related to the systematic review, work is being carried out to create a list of REAMIT technologies. Data/literature review is being performed to understand where the food waste occurs in the FSC and how REAMIT can contribute to the reduction of it. Data from companies will be collected in this regard.
- As for deliverable 1.2, Tamiris informed that the general questionnaire was already finished and ready. However, Dr Fionnuala was on annual leave and she did not have the chance to provide feedback. For this reason, Tamiris requested not to present the data on Monday, but instead to do it on the REAMIT meeting in July.
- Tamiris informed of Fionnuala planning a meeting with Shane re Symposium next week.

**Action for Tamiris: to inform Gael of not presenting the date in the Monday meeting.**

- Ulster – Mapping of the technologies used in the Food Supply Chain - William informed that the collection of this information had been carried out through approaching companies in interviews/meetings rather than a standardized questionnaire sent to them. Overall, companies informed of food waste occurring in situations that most companies face.

**Action for William: Kate proposed for William and Tamiris to meet up and join forces regarding the mapping of technologies as UCD-Ulster could both benefit from working closely together on this.**

- William expressed that a questionnaire approach could also be used, there was no problem foreseen in this regard, but inputs had been collected from interviews thus far.
- Tamiris shared that, at the moment, information had been collected from lit. review, but collecting it directly from companies will take place.

**WP Communication**

- Sasha is currently working on the newsletter project and it is expected to be released in mid-July. Sasha is requesting to all partners to give their inputs on relevant progress/activities to be published. HMF could be featured in the newsletter as they expressed their consent/interest in their name being shared publicly.
- Partners were encouraged to produce at least two communication actions before the end of June.
  - University of Nantes have already communicated through social media (Twitter and LinkedIn) and communication through REAMIT website will also take place.
  - Sasha requesting inputs from Ulster, UCD and BED. Communication can be done by means of the template that Sasha provided. William informed that James is not yet working full time on the project. William does not have the template.
- Sasha informed that she is currently working on the stand-alone website for REAMIT. Efforts are being made by her to push it forward and have it ready soon and included in the June's financial report.
- CASE STUDIES: Currently work on 2 case studies has been started. Those are: Yumchop and HMF.
- As for Picnic, they do not want their name published, which has been seen as being a trend among companies. Sasha has been working on a proposal to communicate Picnic work done considering this limitation, but has not heard from Imke or Picnic.

**Action: Kate asked Sasha to propose strategies and implications for communicating about REAMIT pilot tests in two situations when: (i) when a pilot test partner prefers to stay anonymous in REAMIT communication materials; (ii) when a pilot test partner agrees to have their name used openly in REAMIT communication materials.**

- Sasha expressed that communicating with partners can be challenging as sometimes/often no response is received despite her efforts, thus limiting or delaying outputs. Kate proposed to wait until WPT1 meeting on Monday (21/06/2021) to get updates from partners. This issue can be presented in the July meeting (lack of response). As per comments on the template, no inputs from Levstone, SenX.

- UCD: to post template through social media. Tamiris will talk to Fionnuala as soon as she is back on this.
- July's newsletter to include:
  - New staff recruited
  - Egg powder company (IGRECA) related progress due to importance of this food constituent as found in many products. **Action: Sasha to liaise with Ali from UoN to get his input for an article on egg powder and Raman Spectroscopy.**
  - Possible articles on: relevant progress on pilots, an online event that Ram and Kate participated in (Interreg NEW Impact event, May 2021), update on big data/data hub, 3<sup>rd</sup> REAMIT symposium in December-2021 (hosted by UCD). **Action: Tamiris and Xavier to discuss with SW and FM date and theme of 3<sup>rd</sup> REAMIT Symposium in December 2021 and confirm it to Lead Partner by end of June 2021.**
  - **Action: Kate to send an email to Natalie from HMF to see what can be published. Kate to lead contact/liaison with them.**
- Currently working on the stand-alone website for REAMIT. Efforts are being made by Sasha to push it forward and have it ready soon and included in the June's financial report. As for other Interreg websites, they are not a good example to follow as they seem not to include funding agency and maybe they are no longer funded by Interreg or those are other versions of the project.
- **Kate expressed the need to develop a strategy to implement when companies want to remain anonymous in REAMIT pilot tests. Action: Sasha to prepare scenarios and bring this at RSC meeting on 8/07/2021.**
- Kate encouraged all partners to take on social media communication training given Sasha's expertise on it.

**Action for Sasha: to consult with Ram if it is not too early to communicate regarding HMF, as they have joined only recently.**

**Action: Sasha to send template to William on communicating about REAMIT in local communication channels.**

**Action for partners: to provide relevant progress/activities update to Sasha for July Newsletter.**

#### **WP Management**

- Partners to attend meeting in July (RAC/WP/RSC) on 7 – 8 July 2021. It will be hosted by NTU.
- Activity reports from eMS need to be shared with all PPs as pdf files by 18/06/2021.
- Interviews for Lohit's replacement will take place in BED on 18/06/2021.

#### **WP long term**

- Expecting inputs from UCD on symposium taking place in December (deadline: end of June).

**Action for Tamiris and Xavier: to discuss with Shane and Fionnuala the plan for the next REAMIT symposium (December 2021) hosted by UCD; and confirm by end of June date of the Symposium so it can be publicized in REAMIT newsletter and social media.**

**Date for next meeting – Thursday, 1 July 11am – 12.00 pm.**

## REAMIT sub-group meeting, 1/07/2021

**Attended by:** Katarzyna Pelc, Sasha Bennett, Gautam Samriya, Tamiris Da Costa, Xavier Cama and James Gillespie.

### **WPT1 Pilot tests**

- Human Milk Foundation (HMF) and Yumchop, UK – Kate confirmed BED was going ahead with pilot tests with HMF and Yumchop.
  - HMF: The equipment is ready, it has been configured by Whysor and they are going to ship equipment to England for HMF tomorrow. Because of lockdown / quarantine, they cannot travel to install it, so they will be providing remote assistance to install it.
  - Yumchop: Similarly, meeting tomorrow with Yumchop to discuss shipment of equipment from Whysor to Yumchop and installation with remote assistance.
- Whysor have recruited 2 further pilot tests in the Netherlands. Both companies are food production / food processing companies. Meeting planned with the two companies, BED and Whysor regarding detail of the pilot test trials.
- No updates from other pilot tests: Picnic, Spectroscopy (at UoN in France).
- UCD: Xavier informed he was talking to Dr. Shane and they decided on a PoC using temperature data loggers. At later stages they want to engage with companies and will include a QR code which will show the origins / transportation of chicken fillets while recording temperature as well. Dr. Shane said purchasing equipment can start. First phase will be carried out in July and August and will involve lab setting. Then later they hope to roll out to companies.

**Action: Xavier to make a PowerPoint presentation of the planned pilot test at UCD at RAC/WP/RSC meeting (7-8/07/2021).**

- MTU: Gautam shared that Pat is approaching the contacts from Meat Technology Ireland but we have got no substantial reply from them as yet.
- Ulster University: James shared updates on trials with Dry Aging, Clostridium bacteria and Musgrave. On Dry Aging, James is going to visit WD Meats next week to install the temperature and humidity sensors at the Dry Aging chamber with Mark. Mark has organized an electrician and the networking guy. Hopefully it will go fine. On Clostridium trial, Mark has been freezing some swabs for UU so hopefully UU will be able to continue with the minimum limit of detection trial. But we needed to get DNA extraction kits ordered and they're currently entered into the University procurement system, but no update on order actually getting placed. As its large amount of money, it taking time at University adding to previous delay due to no communication with WD Meats for couple of months. William taking lead on this. Website of manufacturer mentions 26 days of delivery time after order, so don't see further progress on trial until August 2021. On Musgrave, not much further progress. James picked up a computer and that's configured for app development. Android device to do development on should be arriving. Realistically development to start by end of July or beginning of August.

- NTU: Sasha informed they are still waiting to hear from brewery in Liverpool. They had mentioned that by July, they'll be able to reopen so that we can have access to go on site or it might be a virtual visit, but we're still waiting to hear from them.
- Kate said herself and Ram have contacted the south east midlands development agency who are going to provide contacts for us. She asked if Sasha was in the same area. Sasha informed she is in East Midlands area and is already in regular contact with the local enterprise development company.
- Kate shared she has invited representatives from HMF and Yumchop for RSC/RAC/WP meeting and they will be presenting. She encouraged James to invite the representatives from WD Meats and Musgrave. Sasha shared representative from Weather Logistics from Nottingham will be attending.

**Kate asked James about the status on Previous Action: For William and James to contact Levstone to discuss compatibility of the app and utilize it appropriate for the pilot test with Musgrave.**

James advised that has not happened yet. Maybe they will go for an app of their own and not contact Levstone for this.

- Kate shared a requirement for an app for HMF getting alerts. Freezing temp usually -20 C, if it goes above -10C they should get alerts. She discusses with James feasibility of this app and if they can think on working on such app. James says he can't see why it cannot be done through app but it could be a sizeable amount of work and they are prioritizing trial work currently. But it should be doable.

#### **WP T2 Big Data Hub**

- Staff recruitment at BED: Kate informed interviews were conducted on 18 June 2021 for replacement of Lohit. A lady from Iran, Sahar, who is a post-doc in UK already, is recruited. She will start around the end of August 2021. She is very experienced with big data analytics and has good publication record, so we feel we've selected a very strong candidate.
- Lohit left some jobs on his desk regarding purchasing licenses. We have decided to go for the option with unlimited number of users having access to the data analytics server. This will be further sorted over the summer by Kate.
- MTU updates: Gautam informed that there were few access issues between MTU at BED – access to shared database instance of MTU at BED server, access to Windows user account of MTU at BED server in past week. Gautam was communicating with Joy and access to shared database instance was resolved by Joy a couple of days ago. For other issue, Gautam, Joy and Wayne (Levstone) are planning to have a live trouble shooting call in few days.
- Gautam mentioned, he is awaiting for a meeting with Kate on pilot tests with Yumchop and HMF for Data Requirement document.

#### **WP T3 Business Development**

- Systematic Review to create list of REAMIT Technologies (Deliverable 1.1) – UCD and Ulster University are working together on it. One Master student at UCD also working on it. Currently working on Introduction. Presentation to be done in RSC/RAC/WP meeting.
- Life Cycle Assessment (Deliverable 1.2): Tamiris shared the questionnaire with Dr. Fionnuala for review and she would review it by end of the week. Questionnaire will be presented at RSC/RAC/WP meeting.

- Mapping of the technologies used in the Food Supply Chain: William (Ulster University) had informed earlier that the collection of this information had been carried out through approaching companies in interviews/meeting. An action was proposed in earlier meeting for Ulster and UCD to meet up and join forces regarding the mapping of technologies as UCD-Ulster could both benefit from working closely together on this. It is an ongoing action.

**Action: James and Tamiris to meet up and join forces regarding the mapping of technologies as UCD-Ulster could both benefit from working closely together on this.**

#### **WP Long Term Effects**

- Symposium at UCD
  - Tamiris informed that they had discussion at UCD with Dr Fionnuala and Dr Shane about the format, theme and tentative date, aim and target groups for the symposium.
  - Tamiris informed that it was decided the format of symposium would be online. For dates. Dr Shane preferred sometime in November 2021 or in the beginning of December 2021 but not finalized. They decided to ask opinion of other partners in the meeting next week on dates and also on invitation to target groups. Regarding target groups, they discussed, to attract the policy makers and companies and their recruitment, it would be important to show them the results and work of existing partners and Symposium could provide a platform for this. However, they were still not sure about the amount of progress of partners till November or December, thus they decided to ask opinions of other partners regarding invitation to target groups.
  - Kate asked Tamiris to prepare a few slides on this and ask the opinions of all the partners regarding the date, theme, aim, duration format (half day/full day) and target groups in the meeting next week, which Tamiris agreed.

**Action for Tamiris: To prepare presentation slides on REAMIT 3<sup>rd</sup> Symposium planning for the meeting next week and ask the opinions of all partners regarding the date, theme, aim, duration format (half day/full day) and target groups.**

- Case Studies:
  - Tamiris informed that she, Gautam and Xavier started work on case studies on HMF and Yumchop. They have had couple of meetings and have divided the work into Introduction, Company background and Problem with the food waste.
  - They have also prepared a document having progress on case studies and shared on a shared drive.
  - They did not have any one-to-one meeting with the companies by then and the progress was mostly based on online research.
  - They are to present the case study in RSC/RAC/WP meeting as well.
  - Xavier asks Kate if companies are aware of the case studies being done at REAMIT and how the case studies will be used by the companies. Kate replied that she is not aware if the companies were aware, Ram and Usha are leading it, and encouraged Xavier to get answers to these in the RSC/RAC/WP meeting as these are important points.

**Action: Xavier to ask the members in the RSC/RAC/WP meeting about the use and strategy for Case studies in REAMIT.**

- Policy and Compliance:
  - Kate shared that she had a discussion with Abby, Finance Manager, Yumchop regarding the temperature monitoring as a policy requirement for the company where REAMIT could be helpful. Kate advised to understand policies as well for each of the pilot test company and how they can be improved because of REAMIT. She advised to explore policy and compliance for the pilot test companies. It will help us to deliver policy impact objective as well.

#### **WP Management**

- Kate informed that she has received individual partner reports from all the partners and is currently processing the project report as an input for the meeting next week.
- University of Bedfordshire have finalized recruitment of Lohit replacements.
- Kate is still dealing with 12-months extension of the REAMIT project. It's currently sitting in the approval process at the University of Bedfordshire. Kate is working on the progress report and financial report and its on her To-Do List for the next weeks.

**Action for Kate: Work on the progress report and financial report.**

#### **WP Communication**

- Newsletter: Sasha informed that work on the newsletter is currently underway. She is collecting information and awaiting some materials from the partners. Newsletter is planned to be released in mid-July. Screenshots and articles from RSC/RAC/WP meeting to be included in the newsletter.
  - Sasha asked Kate for some content from HMF for newsletter. Kate replied she could communicate with HMF. She also mentioned we have some sensor images of HMF that could be used as well. Kate will communicate with HMF and will share content with Sasha.
  - Sasha received introduction from Xavier and James. Waiting for introduction from Tamiris and some content from Joy as well. James to provide self picture as well to Sasha.

**Action for Partners: To provide relevant input to Sasha for July Newsletter.**

**Kate: Provide HMF content and pictures to Sasha for newsletter.**

**Tamiris and James: Tamiris is to provide introduction paragraph and self image to Sasha. James is to provide self image to Sasha.**

**Sasha: To follow-up with Joy and get article about update on Big Data hub at University of Bedfordshire.**

- Communication Actions - Sasha informed that she has been trying to push for partners' communication actions through either online social media or through websites or local communication channels and aim for at least two communication actions by each partner in next few months. Update so far:
  - I&R in France have published using the template that we created.
  - Valorial have published on their website about REAMIT.



- At Ulster University, James has completed a template and it has been published on Ulster Facebook page. We're just waiting if that has been published by Ulster's school office anywhere else as well. James will update us on that.
- University of Nantes has also created a poster based around the Igreca pilot test. Have requested Ali to put it on the website for the laboratory that they have at the University of Nantes as well as on the main website of the university.
- Nottingham Trent University will be publishing to the Nottingham Business School News.
- Sasha said Kate has also customized the templates and also sent some communication to few government organizations, University of Bedfordshire Business School websites and online social media.
- Following with UCD folks Xavier and Tamiris and waiting if they could send something to their school's media channels. Xavier and Tamiris will check and update us on this. Sasha mentioned that she is ready to help partners at UCD by sharing some examples and format/template of how other partners and colleagues have published about REAMIT on their various communication channels.
- Kate asks Sasha to present few slides at RSC/RAC/WP meetings to showcase examples how partners and colleagues of REAMIT have been publishing about REAMIT on various communication channels. Sasha agrees to it.

**Action: Sasha will be presenting at RSC/RAC/WP meetings to showcase examples how partners and colleagues of REAMIT have been publishing about REAMIT on various communication channels.**

- Sasha mentions that she has not heard on communication from SenX, Levstone and MTU and plans to discuss it with them during the RSC/RAC/WP meeting.
- Kate suggests Sasha to ask direct questions to the partners regarding their communication actions, as this help streamline the plan. Direct questions such as Who is the target group for their business? What can they say to their target group about REAMIT? What would be interesting thing for their target group about Reamit, so they would need to customize? Sasha likes the suggestion and agrees.
- Stand-alone website procurement:
  - Sasha informs that procurement of the new website for REAMIT, a standalone website - separate to the interact project page, is completed through square space which is an online website building platform.
  - It did take a bit of time to get this sorted because there were some procurement issues with NTU which is now sorted. NTU will be developing the website soon through square space.
  - Sasha will also speak to Gael, who had originally bought the domain [www.reamit.eu](http://www.reamit.eu), to get the domain transferred from the Interreg REAMIT page to the new square space page.
- Videos:
  - Sasha informs that Video and Case Study for Picnic pilot test are almost completed. She heard from Imke that they are hearing from Picnic now and and they're happily corresponding with Picnic now. The video and case study are ready to publish but we will have to wait for a confirmation from Picnic before we can go ahead with publishing the video and case study.
  - University of Nantes – There is a video for the University of Nantes pilot test with Routhiau, but again we have not heard from Ali about this. Awaiting information from Ali before going ahead with it.

- Yumchop and HMF: We'll be developing new videos very soon. It was proposed by Ram and he's proposing that Sasha would travel to the site of these companies to make these videos. We have made some large format posters of REMIT and that can be attached to the refrigerators at Yumchop. Sasha will be working on it in July.
- Case Studies – Sasha informs two new case studies for Yumchop and HMF are being developed by Tamiris, Gautam and Xavier.
- Kate asks Sasha if she can present few slides about new stand-alone website in the RSC/RAC/WP meeting. Sasha agrees.
- Kate informed regarding visiting HMF, that HMF have invited us to their third birthday party, sometime in August. Kate asks colleagues interested in it to follow up on this.
- Kate suggested to all to understand policies and regulations also while meeting with the companies and explore how REAMIT could be helpful in meeting these requirements.
- A review of plan for the upcoming RSC/RAC/WP meeting was done.

**Action for Sasha: To present few slides about new stand-alone website in the RSC/RAC/WP meeting. Exploring use of REAMIT technologies in delivering policy and compliance requirements while meeting with the companies.**

**Next meeting date: Thursday, 22 July 2021, at 12 pm.**

## REAMIT sub-group meeting, 22/07/2021

Attended by Katarzyna Pelc, Sasha Bennett, Gautam Samriya, James Gillespie, Tamiris Da Costa and Xavier Cama.

### **WPT1 - Pilot tests**

Running pilot tests:

- HMF and Yumchop: Kate has arranged the shipment of sensors with a small courier company from Whysor's office in The NL to HMF and Yumchop's addresses in the UK. All sensors shall be delivered to HMF and Yumchop's addresses by 31/07/2021.
- No update from UU since Monday's monthly meeting of WP T1. James has sent emails to check that the sensors have been ordered.
- Picnic: Whysor have visited Picnic fulfilment centre in Apeldoorn, The NL on 13/7/21 and installed 4 sensors in 2 different boxes in order to define (i) the best position for the sensor (on the bottom or at the top of the box); (ii) the best way to stick the sensors (hard plastic) to the box (styrofoam). Whysor tried two different types of glue: manufacturer's double-sided tape and special flexible adhesive sealant. Sensors are working fine and data is coming to Whysor platform.
- BIOGROS – no updates
- No updates from Ali from UoN. Ali has not attended the WP T1 monthly meeting on 19/07/2021. Ali has not responded to emails from Gael and Kate, who asked Ali for updates on pilot tests with IGRECA and Prince de Bretagne.
- Xavier at UCD has developed a leaflet about the Cyberbar system. Kate suggested sending it to Sasha for formatting; and for including information highlighting the unique characteristics of the REAMIT project.

**Action: Sasha to format the Cyberbar leaflet.**

**Action: Kate to add information in the Cyberbar leaflet on characteristics of the REAMIT project.**

- Glen Affric - Sasha and Kate met with Dan Bradley from the University of Liverpool in conjunction with Glen Affric, as well as Marcel from Whysor to discuss the type of sensors required for this pilot. NDA has been signed between NTU and Glen Affric to go ahead with the pilot.

New pilot tests:

- Blue Skies (UK): Ram and Kate met online with Blue Skies, UK company importing fresh fruits and vegetables from across the world (i.e. from places where fresh food is grown and cut e.g. Brazil, South America, Mexico, Egypt, etc.) to the UK. Blue Skies sell fresh fruits in supermarkets in UK (Sainsbury's, Waitrose, Aldi, etc.) cut in small pieces and offered as snacks. Blue Skies are very much interested in going ahead with this pilot test as they will benefit from REAMIT's approach to monitor conditions (temperature) in which fresh food is transported on the planes. This is especially the case when fresh fruits are transported by planes from overseas locations with a connecting flight. In such cases, often fresh food is left in containers at airports (e.g. in Dubai) waiting for a connecting flight to the UK. Often, fresh food is left for hours in hot terminals or outside the airport terminal (where temperatures

are often above 30 degrees C). This causes food waste, as fresh food which then arrives to the UK (e.g. after 18 h of travel) is not fresh anymore and often cannot be used in any way. BED will discuss with the founder whether working with Blue Skies will be considered eligible, as IoT equipment will need to be installed in food containers traveling from outside the NWE region.

- Van de Huijgevoort Groep: (VHG): producer of fresh bread, salads, toast salads, potato salads, meat processing company for cold cuts and semi-finished products (e.g. chicken for salads, minced meat for sausage rolls); the company owns 3 supermarkets. Although they don't have a lot of waste, they confirmed that listeria bacteria are a serious issue, as once it appears a lot of food goes to waste. The pilot test would focus on detecting these bacteria. The use of Fresh Detect sensors has been mentioned.

**Action: James to discuss with Joan whether Ulster will engage with Sensipdx and if yes, in which way (e.g. through external consultancy contract, Visiting Lecture contract).**

**Action for all: to review the Levstone's app for REAMIT available on the android app store, to provide feedback at the next sub-group meeting.**

#### **WP T2 – Big Data Hub**

- Dr Sahar Ahmadzadeh (Lohit's replacement) shall join the REAMIT team at BED at the end of August. Sahar is currently waiting for a new Visa to start work at BED.
- Joy Eze's Visiting Lecture contract at BED has not been re-issued yet, so Joy's involvement in WP T2 has been marginal in the past weeks.
- Gautam said there have been access issues between BED and MTU. Gautam, Joy and Wayne met online to discuss these issues, and resolved them.

**Action: Gautam to send a reminder to Imke to provide information on food quality.**

- Data from WD Meats is sent through Whysor dashboard, and that data will be transferred.
- James asked who would be doing the data analytics in REAMIT.
- Gautam says that data have been transferred manually so far, they will set up a process to transfer data from the Whysor dashboard to Bedfordshire server. This has not been achieved yet.
- Kate proposed to organise WP T2 meeting within the next 2 weeks to address the matters of data analytics and roles of partners.
- Kate asks James, when the data analytics could start. James suggests by August this should be possible. Gautam and James are available to start data analysis.

**Action: Kate to check with Ram whether it is advisable to have WP T2 meeting in a couple of weeks or wait for a new staff member to start her role at BED on 26/08/2021.**

#### **WPT3 – Business Development**

- Tamiris of UCD and James of UU presented an update on WPT3 jointly at the RAC Meeting. Tamiris says she is working on the questionnaire which should cover all topics under the LCA.
- Tamiris advised they will start looking at Yumchop and then they will be collecting data on Picnic pilot test and other pilot tests. Tamiris said this information will be ready by the end of this week to be sent to Yumchop. A meeting would be important with Yumchop to be arranged by Kate. Kate advised

that BED preferred not to contact Yumchop yet for a meeting and to fill in the questionnaire. This pilot test has been delayed by several months, and it was important to set up the sensors first and ensure data was sent to the REAMIR cloud, before asking Yumchop for online meetings and provision of data through the questionnaire.

### **WP Communication**

- Newsletter for July 2021 is underway. It is almost complete, but Sasha is still waiting for materials from partners and final sign off to be published in the final week of July.
- Case Studies: Kate suggests establishing value added of case studies for pilot test companies. There were some ideas mentioned in meetings with Usha – academic benefits and commercial benefits from REAMIT case studies.
- Kate asked those who meet with Usha on case studies, to make notes from the recordings to identify these benefits.

**Action: Gautam to coordinate the work on reviewing recordings from meetings with Usha on case study writing and develop bullet points listing these benefits for pilot test companies.**

- James expressed concerns that companies like WD Meats will not want to share certain information about their business; some things/information may be sensitive and difficult to ask for; the meat industry is very touchy about having any negative press; they are also very protective over their data and information.
- James would try and speak to Mark at WD Meats to see if they're happy for certain details to be published in REAMIT communication materials.
- The approach to case study writing may need to be individualised and designed specifically around the pilot test partner company/organisation.
- Partners' communication actions: so far Valorial, NTU, UU, BED, Images and Reseaux and UON have developed posts about REAMIT in social media.

**Action: Gautam to develop a post about REAMIT for the IMAR/MTU website.**

- NTU still have not heard from some partners like Senx and Levstone regarding their posts about REAMIT published in social media. Kate suggested that NTU arrange 1-1 meetings with these companies to push them to develop such posts.

**Action: Sasha to contact Levstone for to arrange 1-1 session to help them develop and post about REAMIT in social media. The post to be published by end of August.**

**Action: Sasha to propose communication approach in case of these companies in REAMIT pilot tests, which wish to remain anonymous in REAMIT communication materials and channels. An online meeting/exchange with the Communication Manager at Joint Secretariat may be helpful, as this may be the case of other Interreg NWE projects as well.**

- Stand-alone REAMIT website: Procurement is completed, the website has been purchased through Squarespace. Sasha will be working on developing the website with a plan of all the tabs and content for the next few weeks.

**Action: Sasha to present the first draft of the stand-alone REAMIT website at the next meeting of the REAMIT sub-group, to get feedback and ideas from other colleagues.**

- REAMIT Videos - Imke confirmed in WPT1 meeting she has been in meetings with Picnic, they are finally responding and will slowly propose to them about the publishing of the video and case study. Sasha will travel to the site of HMF and Yumchop to make videos and attach large format magnetic posters to the fridges of Yumchop.

#### **WP Long Term**

**Action: Tamiris and Xavier to discuss internally at UCD when the REAMIT Symposium should take place at UCD and by mid-August propose a date to LP and REAMIT partners.**

**Action: Tamiris and Xavier to send an invite to the LP for a planning meeting for the third REAMIT Symposium. Attendees UCD and BED (possibly NTU).**

#### **WP Management**

- Kate sent to JS the REAMIT project 12 months extension budget proposal but had no news from JS yet. REAMIT officer at JS has been on leave until 9 August.
- Kate confirmed that BED finance started to make payments to REAMIT partners (4<sup>th</sup> tranche). Levstone, Senx, Whysor have been struggling as they have been waiting for payment from LP since May 2021.
- Kate is developing 5<sup>th</sup> REAMIT project progress report in eMS and assisting partners with issues they have when developing 5<sup>th</sup> progress report.
- Minutes from RAC/WP/RSC meetings are being collated by Sasha. Minutes have been uploaded by James on a shared google drive document which others have contributed to. Sasha is to try and collate everything by the 3<sup>rd</sup> August. In case of delays, Sasha shall let Kate know.

**Next meeting to be held: Thursday, 5 August, at 11 am.**

## REAMIT sub-group meeting, 10/08/2021

Attended by Katarzyna Pelc, Sasha Bennett, Gautam Samriya, James Gillespie, Tamiris Da Costa and Xavier Cama.

### **WP T1 - Pilot tests**

Running pilot tests:

- HMF and Yumchop: the sensors have been delivered to the premises,
- HMF: the sensors have been installed. The sensors are sending data since last week, but it is not known yet if the data is being received at the cloud. This information will be provided by Tom from Whysor at WPT2 meeting on 10/08/2021.
- Yumchop: They will be setting up the gateway and connecting the sensors this week with online support from Tom.
- Picnic: No updates.
- IGRECA and Prince de Bretagne: No updates from Ali from UoN. Ali has not responded to emails from Kate and Gael, who asked for updates on pilot tests.
- Glen Affric – Regular communication with Dan Bradley from the University of Liverpool and Glen Affric about the type of solutions that they're looking for. Waiting to speak to Whysor to decide exactly what temperature control monitors and the solutions will be able to offer them.
- UCD and UU: Feedback from Shane, who is in touch with a chicken processing company in Northern Ireland (Moy park). QR code labels will be used instead of cyberbar. Temperature and location will be monitored to ensure quality during the distribution of their products. A car will be rent to test the prototype and a box will be assembled with a very simple sensor and a product with printed codes.
- WD Meats: No updates, but for the dry aging chamber pilot, the sensors are installed and sending data. For the Clostridium bacteria pilot, the company want to use the PCR DNA. The DNA machine at the Ulster lab needs to be repaired, but if it is not possible, a new equipment will be purchased.
- Musgrave: No updates. James has sent emails but there is no activity from the group.
- BIOGROS: No updates.
- Van de Huijgevoort Groep: No updates.
- Blue Skies (UK): BED obtained approval from the founder to go ahead with the pilot test. However, it is necessary to discuss with Whysor whether they are able to work in such remote ways and check whether there are funds to afford this kind of pilot test.

**Action: James to discuss with Joan whether Ulster will engage with Sensipdx and if yes, in which way:** Not completed yet.

**Action: Xavier to review the Reamit project Application Form and rewrite the leaflet.**

**Action: Kate to finalise the leaflet.**

**Action: Sasha to format the leaflet.**

### **WP T2 – Big Data Hub**

- Kate talked with Ram about having a WP T2 meeting before the new staff member (Sahar) starts her role at BED at the end of August. He agreed because different analytics partners are ready and keen to start discussing it.
- WPT2 meeting with analytics team is scheduled after the subgroup meeting on 10/08/2021.
- The goal of the meeting is to discuss how to do data analytics and how different analytics partners should work together on data analytics. In particular, the approach for the analytics partners to start work on the data and to understand the whole process, the different stages, the different tasks and the roles.
- There is some data coming from different pilot test already into the Reamit cloud and Whysor will give an update about it.
- Dr Ram has been approached by a company in the USA that is monitoring food waste using big data analytics and this company has approached for a meeting in order to understand the synergies for collaboration.
- Dr Sahar (Lohit's replacement) shall join the REAMIT team at BED at the end of August. Sahar is currently waiting for a new Visa to start work at BED.
- Gautam sent a reminder to Imke and Tom to provide information on food quality, but they did not address some questions. Tom just replied that they are now having some progress with the sensors and are now beginning to collect data. Gautam asked about the Picnic business, but have not heard anything from them yet.
- Gautam reported some issues regarding connectivity that happened intermittently in the system and to solve this problem it has been necessary to reset the password.

#### **WP T3 – Business Development**

- Tamiris of UCD is working on Human Milk Foundation case study. She adapted the questionnaire for the HMF, based on other LCA studies of breastfeeding and breastmilk substitutes.
- What is the best approach to collect data from the companies? The questionnaire proposed can be complex, so approaching the companies by email with some questions can be also a good method.
- HMF do not need many inputs, the LCA inventory will only comprise the transportation, processing and storage.
- Kate sent an email to HMF proposing a meeting with them this week. Tamiris, Nevedha and Kate will be attending this meeting to explain what is LCA, the benefits to the environment and how to complete the questionnaire.

#### **WP Communication**

- Newsletter for July 2021 has been published and shared with about 102 contacts that subscribed the newsletter.
- The plan for the future newsletter is to promote the subscription form that there is available on the website. Because many people are not aware that this option exists.
- Sasha will be promoting the subscription on social media before the next newsletter is released.
- A good amount of interaction on Twitter and LinkedIn has been observed in the last months.



- Sasha had a meeting with Gautam to discuss how to communicate about Reamit through the channels. A template was drafted using the original formula that was created.
- Sasha had been working on the website for the past two weeks. It has similar topics to what we have on the existing website, but the layout is a lot different.

**Action: Sasha to present the first draft of the stand-alone REAMIT website at the next meeting of the REAMIT sub-group, to get feedback and ideas from other colleagues.**

**Action: Sasha to propose communication approach in case of these companies in REAMIT pilot tests, which wish to remain anonymous in REAMIT communication materials and channels. An online meeting/exchange with the Communication Manager at Joint Secretariat may be helpful, as this may be the case of other Interreg NWE projects as well: On going action.**

**Action: All to look at the app proposed by Levstone and provide feedback in the next meeting.**

#### **WP Management**

- Payments are being done from BED finance to REAMIT partners.
- Kate still waiting for minutes from the RAC/WP/RSC meeting.
- There might be a delay of the approval by the funder of the REAMIT 12 months extension budget, because Bid Support Unit spotted they have done wrong calculations and needed to correct the calculations. The new figures need to go again through internal approval process at BED. The REAMIT 12 months extension budget proposal has been resubmitted for internal approval at BED, which can cause a delay.

#### **WP Long Term**

**Action: Tamiris and Xavier to discuss internally at UCD when the REAMIT Symposium should take place at UCD and by mid-August propose a date to LP and REAMIT partners: On going.**

**Action: Tamiris and Xavier to send an invite to the LP for a planning meeting for the third REAMIT Symposium. Attendees UCD and BED (possibly NTU).**

Next meeting to be held: Wednesday, 25 August, at 11 am.

## REAMIT sub-group meeting, 25/08/2021

Attended by Katarzyna Pelc, Sasha Bennett, Gautam Samriya, James Gillespie, Tamiris Da Costa and Xavier Cama.

### **WP T1 - Pilot tests**

Running pilot tests:

- Most partners (apart from Tamiris and Xavier) participated in the WP T1 meeting earlier this week (23/08) so updates for T1 were brief. Quick overview was as follows:
- No news from Ali about pilots in France.
- Yumchop have now received equipment - gateway and sensors - and setting up with help of Whysor. Sensors are yet to be connected but company is very enthusiastic to be participating.
- HMF has 2 sensors deployed at the moment, but they are experiencing some initial connectivity challenges. There will be a meeting tomorrow (26/08/2021) between Whysor, HMF, BED and other interested parties to discuss the issues and to help debug. Kate invited anyone from the subgroup who would be interested in joining to participate. James is already participating. Gautam said he would also like to join.
- Blue Skies (UK): UK company transporting fresh fruits from overseas locations (e.g. Brazil, South Africa, Egypt, etc.) to UK and selling them as fresh snacks at supermarkets such as Sainsbury's, Waitrose, Aldi, etc. BED obtained green light from the funder to go ahead with this pilot test; now BED is waiting for confirmation from Whysor whether this pilot test is doable (internet connectivity) and affordable for the REAMIT team, since it involves installation of sensors in food containers travelling all over the world.
- UK company transporting wines: Some pallets of wine are being stolen during transportation, so this company would like to work with REAMIT so they can detect theft before wine is delivered to destination. According to them, the theft of wine is a serious issue.
- WD Meats (Dry Aging trial): The first iteration of the dry ageing chamber trial has now been completed. James is still waiting for Marc to provide the start and end weight of each of the carcass' so he can calculate percentage weight loss and map this data to the sensor data at the 4 locations. James has performed some initial data cleaning and time series plots on the data in preparation.
- WD Meats: Clostridium trial: the qPCR machine at Ulster has broken down and James is still waiting on word on whether this is to be repaired or replaced. The swabs for the trial are yet to be ordered after an issue with the supplier. If the machinery needs to be replaced, different swabs may be required to be purchased.
- 3D fluorescence trial, in August 2021 James met with Xavier in Belfast and provided hand over of 1 of the fresh detect devices. Xavier has been performing initial experimentation, calibration, and analysis of the device and James and Xavier are planning on working on brainstorming a pilot together. One use case could be at Musgrave to check the freshness / bacteria count on poultry deliveries.
- Musgrave last delivery mile trial: James is going to meet with Marcel from Whysor and discuss the use of IoT cellular sensors instead of Bluetooth sensors to mitigate developing the bespoke Android app. The meeting is due to happen next week (beginning of September 2021).

- Picnic: 20 sensors have been installed inside Picnic food boxes, recording temperature, humidity, and acceleration. Imke will check if shock detection should be recorded although that would require a software update to the sensors.
- There are two further pilot tests in the pipeline with Whysor with BIOGROS and Van de Huijgevoort Groep.
- Xavier: regarding the prototype trial, there is no update as he needs to get the quotes approved for the required equipment and Fionnuala is currently off on holiday.
- Xavier has been performing analysis with the FreshDetect system. He purchased 3 chicken breast fillets and has been analysing the spectra data to see how we could use the equipment for a pilot test. After the 5th day some bacterial growth has been found – i.e. the volume of bacteria is increasing. Xavier has been thinking about merging the fresh detect with the QR code project. Kate said its always possible to duplicate pilot tests in different countries.
- Sasha: last communication from Glen Affric was 6th August 2021 and was between Dan at UOL (Liverpool) and Trevor at Glen Affric, further discussing current problems. The plan is to meet at the beginning of September with Usha and Dan to select the relevant sensors for the project.
- Gautam: For pilots, Gerard is still on leave, however Gautam is hopefully hearing from him either this week or the first week of September. Gautam has mostly been occupied with some work for the case studies. He has also been working on the Picnic data. He has asked Tom a few questions about the data but Tom said he will answer them in the meeting (taking place 26/08).

**Action: Xavier / James to draft a few sentences on how the 3d fluorescence pilot test will be developed over the coming months.**

**Action: Xavier to outline next steps required for the fresh box QR code trial.**

#### **WP T2 – Big Data Hub**

- Kate: we are having an online meeting tomorrow (26/08/2021) with Tom about the labelling of Picnic data. Several partners have confirmed attendance. There are no updates on the purchasing of the licensing, but Sahar is joining BED in August as she has confirmed that her visa has been processed and everything is looking fine for her join BED within the next days.
- Gautham: since we have no labels, there is only very basic analysis possible regarding the trends based on the time stamps. A further conversation with Tom will be vital for progress.
- James explained the concept of data labels and why they would be necessary to get meaningful insights into the data. We need to know from customers if products have been damaged so we can related certain accelerometer / temperature recordings to damaged goods, for example. Kate asked would labelling data be required for all pilots. James said yes, if they are a unique pilot test labels will be required.
- Kate will distribute the minutes of tomorrow to all interesting parties.

#### **WP T3 – Business Development**

- Tamiris has prepared a specific questionnaire for HMF and during the meeting (on 1/09/2021) she plans to explain what input she needs for the LCA. She is confident we will be able to collect data for

the first case study in the next weeks. She is preparing a document to show how important LCA is to companies.

- Kate asked if Tamiris thinks she will be able to collect all the information required for LCA from HMF? Tamiris said she is not sure if she'll be able to collect it all. It should only take 2 or 3 weeks to perform the LCA as we have software to help. Kate asked how long the output is valid for. Tamiris said it depends if it is a dynamic LCA, if yes we will need to constantly update the data, for example differing food waste. We will have different conclusions depending on the inputs.
- Tamiris was reviewing Nevedha Saravananarajan's master's thesis on food waste this week, and is hoping to use some of it for the systematic review.
- No updates from James on WP T3. He is not focussing on this at the minute.

### **WP Communication**

- Kate asked if anyone had looked at the Levstone REAMIT application for smart phones. Tamiris hasn't yet. Sasha was able to view the application on the play store website. Gautam has downloaded the app on his mobile. He found the app to be slick and nice, but many of the features he didn't understand. James thinks that the app has been reused and has much functionality that is not relevant or suitable for REAMIT. For example, there is a messaging feature, contact book, gallery etc which almost makes the app feel like another operating system. All of these functions make the app not user intuitive and would confuse any customer who had to use it. Kate didn't see this as a REAMIT app. She also has a suspicion that it's a reused app. Xavier agrees with James and Kate.
- Sasha: we are looking for pictures, videos, etc. from HMF and Yumchop, so Sasha is wondering if there are any available yet. There is an event on 3rd September 2021, the Yumchop company launch. Ram is going to attend. Kate will check whether Sasha can attend this event too to personally meet Yumchop partners. Hopefully, in this way Sasha can initiate contact with Yumchop partners, which will facilitate developing communication materials on the pilot test with Yumchop.
- Sasha sent an email yesterday: On 14 September there is an all-day event with MAKE UK to meet food and drink providers. Ram and Usha are interested in this. Ram suggested BED could be listed as one of the vendors at the event, which may require some sort of exhibit. Sasha will explore the difference between a vendor and a buyer, to see which is more relevant for REAMIT.
- There is an opportunity to be included in the health and nutrition newsletter for October: Either an article on health and nutrition with REAMIT or a space to advertise. Content needs submitted by the end of August, although it's only going to be 250 words. Sasha said she might need some input from Kate to decide what we are going to talk about. Do we have anything we could specifically talk about, perhaps HMF? or generally highlight, for example the picnic pilot. Yumchop could also fit as they don't add any preservatives. We need to carefully look into our pilot test companies, but Sasha thinks this could be a great opportunity for us. An article about HMF published in July 2021 REAMIT newsletter could be reused for this purpose. We may need to get clearance from Natalie/Gillian on this. Kate will send it to them with information on where it is to be published.
- Leaflet from Xavier (UCD): Xavier shared the first and second drafts of the leaflet. He explained that his idea for the leaflet was inspired by partner's obligation to develop a post for social media. He then developed a first draft of a leaflet focusing on cyberbar. However, Shane preferred that the name cyberbar is not used in the leaflet. Then Xavier developed the second version of a leaflet, with some general and basic information about REAMIT. RR commenting upon the leaflet, stated that it may

require to be developed further. Xavier confirmed he would combine both versions of the leaflet to develop a new draft of a leaflet. Sasha offered to help develop a poster (which allows for more text) and a leaflet. Xavier will share a new version of a draft leaflet for feedback. Xavier's aim for the leaflet is that it contains some basic information about REAMIT, quick to read for readers. If the leaflet can be sorted soon, we can tick UCD off on communication for now. If it is going to take longer, then we may have to make a quick social media post in the interim as UCD is the only partner with an outstanding communication action.

- Sasha presented the new square-space website. The background is a bit busy at the moment with the REAMIT graphic, but this can be updated. You get the option to subscribe to the newsletter straight away, which links to mail chimp. Videos will automatically play. You can see the REAMIT slogan, there's a section on the big data hub although that's to be filled out still. There's events, news and blog, and then the rest is the same as the current REAMIT website.
- Gautam confirmed that the MTU poster is now online.
- Kate asked Sasha if she had the chance to meet with Levstone yet for 1-2-1 session on improving Levstone's communicating about REAMIT through social media. She said not yet.
- Gautam presented his work on "why your business will benefit from a case study?" Highlights include: cost effectiveness, leveraging other brands, attracting more customers, helping build trust, highlighting new products, assisting your sales team, turning your product into a story, discovering your brand evangelists, creating a powerful SEO, opportunities for customer advocacy, understanding your business more effectively, assisting in planning financials and timelines for the project, and it being great for publicity.

**Action: Sasha to propose communication approach in case of these companies in REAMIT pilot tests, which wish to remain anonymous in REAMIT communication materials and channels. An online meeting/exchange with the Communication Manager at Joint Secretariat may be helpful, as this may be the case of other Interreg NWE projects as well: On going action.**

**Action: Xavier to redraft leaflet combining the first and second iterations.**

**Action: Sasha to assist Xavier with formatting the leaflet/poster.**

#### **WP Management**

- 12 months extension budget has been redone by the BED finance team after an error was noted. BED still awaiting internal approval.
- Most partners have finalised their partner progress reports. Several partners are still to complete their audits.
- RSC meeting minutes have been sent to Kate, she is working on it this week. Kate aims to distribute the minutes to all partners by the end of this week once Ram approves it.

#### **WP Long Term**

- Tamiris has sent draft programme for the symposium to Fionnuala and Shane but they are currently on annual leave, so they have not had a response yet. UCD, BED and NTU will meet sometime in September to finalise the symposium programme. Tamiris will give some options for the dates. Kate said that in the next 2 weeks UCD need to propose the dates of the Symposium. This will be communicated to PPs and advertised on the REAMIT website.

- Kate asked Tamiris when she has the meeting with HMF to take some notes and some actions so she can keep a track on what's happening.

**Action: Tamiris and Xavier to discuss internally at UCD when the REAMIT Symposium should take place at UCD and propose a date to LP and REAMIT partners:**

**Action: Tamiris and Xavier to send an invite to the LP for a planning meeting for the third REAMIT Symposium. Attendees UCD and BED (possibly NTU).**

**Next meeting to be held:** Wednesday, 15 September, at 11 am.

## REAMIT sub-group meeting, 5/10/2021

Attended by Katarzyna Pelc, Sasha Bennett, Gautam Samriya, James Gillespie, Tamiris Da Costa, Xavier Cama, Sahar Ahmadzadeh and Joy Eze

### WP T1 Pilot Tests

- Introduction to Joy Eze. Kate welcomes Joy as she helps in the transition period (after Lohit has left BED) to implement WP T2.
- Imke and Marco from Whysor visited the UK for a week in September and went to various pilot test sites, to install sensors and gateways.
- The 1<sup>st</sup> day of Whysor visit- They visited Human Milk Foundation which went well, and sensors were fitted. This visit went successful.
- Sahar will be required to purchase the additional sensors for HMF. Natalie from HMF preferred that Sasha and Kate do not attend the meeting with Whysor at HMF as Natalie was not in attendance. Sasha and Kate will have a chance to visit HMF in future once Natalie is available.
- Sasha gave a briefing on the Yumchop visit in Towcester and Glen Affric visit in Liverpool. Sasha reported that Whysor has installed 10 sensors in total at Yumchop, 9 temperature sensors in the fridge and freezer units around the factory, and 1 sensor was fitted inside the vending machine at Yumchop. The gateway was then installed which is now able to detect the readings from each of the sensors and successfully collecting real time data. Another successful visit.
- The visit to Glen Affric was also successful as Sasha, Imke and Marco met with Dan Bradley from University of Liverpool as well as the team of Glen Affric and went on a full tour around the brewery to understand their need for sensors. A gateway device was also installed at Glen Affric.
- Kate requested Sasha to write a brief on both of these visits, to share with the team. This will be helpful for the newsletter and case studies.

### Action: Sasha to write a brief from Whysor's visits at Yumchop and Glen Affric.

Pilot test with WD Meats: James from UU and Marc from WD Meats are trying to work out the position of sensors in the dry ageing trial. Mark wanted to have the sensors in the lorry during the dry ageing process. By the time they were ready to put this on the trailer, the meat was already on there for 5 – 6 days, so this attempt was unsuccessful.

- James reported that recently, two of the big fridge units had broken down at WD Meats and a lot of meat went to waste.
- James says he is waiting for Marcel from Whysor to get back with a list of sensors for Musgrave. James will be meeting with Trevor Cadden from Musgrave. This is the first meeting since July so will be a great time to catch up.
- James Dooley from UU has proven difficult to contact, so James (Gillespie) has not been able to proceed with the clostridium trials, the testing kit has not arrived as yet.

### Action for James: to contact Imke to investigate the plans for 3D fresh detect sensors.

- Picnic – Kate says she is to procure 20 new sensors for Picnic, as they had all previously broken.

- Imke will need to decide what we will need for Biogros and Blue Skies but there is currently a lot of pressure on Whysor, so we will wait for their updates soon
- Kate asks Xavier for an update on the pilot at UCD, using fresh detect sensors. James had asked Matthias at FreshDetect, if it can be used to measure a product than is packaged in plastic and if the packaging will affect the results, Matthias responded that it isn't configured to work through plastic, the results were inaccurate.
- Xavier will include this in the proof-of-concept test, but he doesn't feel confident in using this in a pilot test. Not able to detect if this bacterium is to be used in a safe range. Kate says Tahmina is now working with these types of sensors so Xavier can work closely with Tahmina on this.
- Kate confirmed that Sarah Davoren was the contact to get new pilot partners in Ireland. She is the Interreg North West Europe Programme contact point person in Ireland.

**Action: Xavier to consider working together with Tahmina on 3D fluorescent sensors.**

**Action: Xavier to contact Sarah Davoren as the main contact point in Ireland for new pilot tests and development of the Symposium.**

- MTU Pilot test – Gautam checked with Pat and Gerard but no contacts have been received as yet, no updates. Gautam had a meeting with Xavier at UCD, to further discuss about new pilot test ideas.

#### **WPT2 – Big Data Hub**

- Joy and Sahar went to the lab to connect to the server. Sahar was able to connect her laptop to the server but still having struggles connecting to the VPN at the Big Data Hub. They have contact IT to resolve these issues of the VPN connection, but this is still yet to be resolved. Also having issues with her ID card to access the lab.
- Joy said she had not any IT issues previously so unsure why Sahar is now having these issues.
- Joy has been in the background helping Sahar connected and catching up with the details of the server. No other tasks can be done until Sahar's connectivity issues are resolved. Her office computer is working with the REAMIT server perfectly fine, just her personal laptop having the VPN issues.
- Sahar has sent a doodle poll for the next WPT2 meeting.

**Action: Sahar to decide date for WPT2 meeting and send invitation to partners.**

**Action: Sahar to check the companies in Joy's email, if the offer for the licenses for the Big Data server is still valid.**

**Action: Sahar to evaluate these offers and decide which one is best for REAMIT. Joy to support Sahar with these actions.**

#### **WPT3 Business Development**

- Tamiris met with Natalie from HMF in September. They discussed the LCA and the benefits of LCA. Another university is already implementing LCA for HMF, so the meeting did not go as planned for



Tamiris. They did not feel comfortable sharing this data with us as it was not published yet. No further response from HMF since then.

**Action: Tamiris to upload notes from this meeting to Sharepoint.**

#### **WP Long Term**

- Symposium: Kate suggests it is now time for Tamiris and Xavier to hear back from speakers. Ram needs to be asked what role he would like to take in the Symposium, maybe chair a session or introduce the project. Kate suggested Peter Campobasso (the new Interreg contact person) to take part in the Symposium online, he is happy to attend. Kate suggests for Tamiris to propose to partners.
- Kate asks, who will be facilitator of this event? For panel discussions. Tamiris will need to explore this. She can speak to Blandine about how they managed the previous symposium online.

**Action: Tamiris to send email to Peter Campobasso at Interreg NWE as a guest speaker.**

**Action: Sasha to update this Symposium on the website with brief details of the symposium. Agenda to be added later.**

#### **WP Communication**

- Sasha briefly met with Xavier before this meeting and will be meeting again with both Xavier and Tamiris after this meeting to discuss the communication plans for the Symposium. Sasha is suggesting creating a poster, creating an email template invitation, and to include printed materials at the Symposium such as copies of the brochure and newsletter.
- Upcoming Newsletter: Sasha to include Interview on Sahar, welcoming a new starter to the team with a brief bio of Sahar.
- Details of the Yumchop factory launch to be included in the newsletter.
- Pilot test visits to HMF, Yumchop and Glen Affric to be included in the newsletter.
- Kate suggested requesting Imke to give an update on the pilot test in Luxemburg and the Netherlands.
- Tahmina is presenting at an event on 18 October to be included in the newsletter.
- Sahar is guest speaker at event, she will send details of this to be included in newsletter and website.
- Kate suggested a WD Meats update from James, James has agreed to this.
- Kate suggested an interview with Peter Campobasso can be included in a future newsletter, as this one is filled with enough content. Peter specialises in policy, so this will be an interesting interview to include.
- A suggestion for an article on WPT2 to be included in the newsletter, to be written by Gautam and Sahar.
- New Website: currently being updated and almost ready to go, Sasha was having issues transferring the domain to [www.reamit.eu](http://www.reamit.eu), but Squarespace will resolve the issue soon.

#### **WP Management**

- Kate reports delays with audits from BED, otherwise the reports are ready to submit.

- Kate is currently preparing new contract for Joy Eze.

**Next meeting: 19 October, 11 am**

## REAMIT sub-group meeting, 19/10/2021

Attended by Katarzyna Pelc, Gautam Samriya, James Gillespie, Tamiris da Costa, Xavier Cama, Sahar Ahmadzadeh and Joy Eze

Apologies: Sasha Bennett

### WPT1 Pilot Tests

- As all participants attended the WPT1 meeting on Monday (18/10), only new developments on the pilot tests were discussed.
- James reported that there hasn't been any changes on the dry ageing trial. James is still waiting for Marc to give a date when the second variation can start. However, they had problems with the refrigeration unit at WD Meats and a lot of meat went to waste.
- James mentioned that the trials would start on this Wednesday (20/10), but due to the problems cited above he expects that the trial get started next week. It also depends on Marc's agenda.
- Regarding the Clostridium trial, the first step is securing the mastermix, which was ordered from Coleparmer on 9<sup>th</sup> Sep 2021 to be delivered to UU. However, it is being difficult to have access to the clostridium sample from UCD and to the best of James knowledge, UCD has the only clostridium sample currently, which previously promised half of the sample to UU.
- Regarding 3D fluorescence trial, one Fresh Detect has been lent to Tahmina and one Fresh Detect has been lent to Xavier.

**Action: James to contact Matthias to ask him what he thinks about the sensing and if he thinks that's within the scope of the fresh detect system.**

- Regarding Musgrave, for the last mile delivery vehicle trial, James is still working with Marcel and he wants to research if there is any cellular IoT devices, since they do not have a Lora network in UK, similar to the ones being used to HMF, but with the functionality of the ones on the Picnic trial. With the system that they already have they are able to know when the vans are in progress, when they start their journey and finish their journey. But they also need a sensor which can report temperature's floating automatically when the van is in transit. In addition, the system should avoid sending false alerts, because Musgrave can receive alerts telling them that there's something wrong when the vans are not operational. James sent an email to Marcel last week about that and they haven't got a reply yet.
- No updates from Ali during the WPT1 meeting.
- Yumchop – Kate said that the 10 sensors are sending data.
- No news from Human Milk Foundation.
- Kate scheduled a meeting last week with a person from E&Y responsible for supporting agri-food companies in UK access finance (Tahmina and Ram also agreed to attend), because he offered help to connect the Reamit project with agribusiness companies in the UK, but he cancelled the meeting.
- Kate also heard from Imke that they are open to go ahead with Blueskies pilot test.

- Xavier sent an email to Sarah Davoren asking her support to approach new companies for the pilot test in Ireland.
- Xavier also purchased a box for the proof-of-concept test, but the sensors have still not been purchased. He needs to send an email to the company asking for details, because they need to be added in the system in UCD.
- For the Fresh Detect, Imke requested if Xavier could send the Fresh Detect sensor and she also asked if Xavier wants to be involved in the pilot. He agreed but shared his concerns that Fresh Detect may not work for specific types of bacteria, because even though in theory we could get a specific signature from a type of bacteria, it is likely that some other bacteria would emit a sign in the same range. So, it is difficult to have specificity.
- MTU Pilot test – Gautam explained that Ger and Pat have tried to recruit new pilots, but they have not received responses from their contacts. Gautam is receiving updates from Xavier for a new pilot test at UCD and what support they can provide parallelly. No new updates from Pat and Gerard.

#### **WPT2 – Big Data Hub**

- Kate asked Sahar for updates about the planned WPT2 meeting on Friday (22/10/2021). According to Sahar, the main objective of this meeting is to check if the data is coming correctly from the Whysor's Cloud to the BED server and check if the approach that the partners are following for analysing data is going in the same way.
- The main four topics that will be addressed at WPT2 meeting on 22/10/2021 encompasses (1) connectivity issue, to check if the partners have connectivity with the Big Data server, (2) check with the partners if they have access to the Big Data server, (3) investigate why data is not coming from Whysor's Cloud to the Big Data server and (4) how the partners are going to look at the data in the Big Data server.
- On 18/10/2021 Sahar and Joy visited the Big Data server at BED and will share the photos in the Sharepoint (under WP T2 folder).

#### **Action: Sahar to upload photos of the Big Data server in SharePoint under WP T2 folder.**

- Kate asked how connectivity will be checked and that partners are connected to the server. At this moment, Sahar only connected to the server and followed the instructions provided by Joy. In the next stage, Sahar planned some meetings with Joy to check how the data is coming from the server.
- According to Joy, she can see who is connected and who is not connected in the server. At this moment, everybody is connected in the server, except few people that just joined the project from August to date.
- Sahar is connected to the server as "admin", she has the admin rights and can access every file and every partner. Joy suggested that Sahar should be connected as "user" also, because as user she could analyse the data without altering it.

#### **Action: Joy to connect Sahar to the Big Data server as 'user'.**

**Action: Sahar to review manuals in SharePoint (WP T2) to learn how to connect a new person to the server as 'user'. If needed, Sahar to ask Joy for help with understanding the steps how to connect a new person as 'user' in the Big Data server.**

Action: Joy to add James, Xavier and Tamiris as users to have access to the server.

- Kate asked if Joy went to the Big Data server and if she saw what data was coming. According to Joy, the data does not come straight, it has to go to Whysor's Cloud first and then Whysor upload the data to the server. The only data that Joy had access at this moment are the Picnic data.

**Action: Sahar to follow up with Whysor to make sure the data is uploaded automatically from the Whysor's Cloud to the Big Data server. This will be discussed at WP T2 monthly meeting on 22/10/2021.**

- According to Kate, data is coming from the 10 sensors installed at Yumchop and we need to have it in the Big Data server. James mentioned that Tom can support this task as he has a script about how the sensors are being configured and how the data are taken from the Whysor's Cloud and transferred to the BED server. However, he is not sure how often this transference occurs, e.g. once a day, real time, every 10 minutes, etc.
- According to Gautam, the script can change according to the type of data.
- Joy asked if the data analysts have accessed the data already in the server or if they have another way to access this data. According to Kate, partners don't have access to the data. In the last meeting of WPT2, Tom send all the data by email in excel files.
- According to James there is a login for the Whysor's dashboard with a general Whysor.Reamit for NWE email address and Lohit can have the password.
- Kate asked James to send the login details by email so the partners can login to the Whysor's Cloud. James sent the details below, but apparently Picnic, HMF, or Yumchop sensors have not been added to this account. Whysor must have a different account with these sensors added and thus only Whysor can provide the data for these trials.

<https://reamit.whysor.com/>  
 login: reamit4nwe@gmail.com  
 password: 7dzgkbNHCBDGBpsw

- According to Gautam, Joy and Sahar would need to create tables for data in the Big Data server for all pilot tests as the ones created for Picnic.

**Action: Sahar and Joy to discuss with Tom who is responsible for creating data structures (tables) in Big Data server at BED.**

- Joy mentioned that this structure comes from script, the code and they need support from Tom to edit it. Any structure with each parameter (humidity, temperature) is written in the script that is transferred and the tables will be automatically generated there.

**Action: Sahar and Joy to discuss with Tom about explaining the process of writing the scripts, the type of data and creating tables for the data on the Big Data server.**

- According to Kate, at the moment there is data coming from Yumchop, HMF, UoN and dry ageing chamber (should be coming soon). New data from Picninc will be coming soon as 20 new sensors are now on the way to Whysor, to be installed in Picnic's food vans.

**Action: Sahar and Joy to login to the Big Data server to understand what data is there.**

**Action: Sahar and Joy to clarify the route of data to the Big Data server. Does it have to go through the Whysor's Cloud and then to BED server or does it have to go to Levestone? What is the role of Levestone in data journey?**

Kate asked partners for option if she should ask Tom to send the data that he already has to share with the analytical partners before the WPT2 meeting (on 22/10/2021), so the partners can look at it and have a discussion on Friday or if it is preferable to first ensure that transition of data to the server is smooth, and then ask analytics partners to look at the data through their own access to the server.

Based on input from partners from UU and MTU, a decision was taken that Tom shall not be asked to send data now, prior to the WP T2 meeting (taking place in 3 days time) as it is too short notice.

- Sahar proposed a meeting with Joy to discuss the aspects about Big Data that were not addressed before and Kate suggested she would also participate in this meeting.
- Sahar is involved in purchasing licenses for the Big Data server and at this moment she is reviewing two different types of licenses – limited and unlimited.

**Action: Sahar to prepare a description about the benefits of these two licenses to present to the partners during WP T2 online meeting on Friday 22/10/2021.**

According to Sahar, to take a decision, prior she needs to know how much budget is available to purchase the license.

### **WPT3 Business Development**

- Tamiris upload the notes from the last meeting with HMF on LCA in the Sharepoint.
- Tamiris received green light from Kate to start approaching Yumchop to collect data for the life cycle assessment.

**Action: Tamiris to update the questionnaire for Yumchop and include specific questions for this company; prepare a presentation, similar to the one showed for HMF, to introduce the questionnaire and explain the benefits of conducting an LCA.**

**Action: Kate to send an email to Yumchop introducing the Reamit LCA team.**

- Regarding the activity involving “Bringing technologies close to the market” which is responsibility of UU, Kate asked James when he is expecting to bring the Professor from the Business School on board.

**Action: James to investigate with Joan how UU can address the aspects related to “bringing REAMIT technologies close to the market” and propose a workplan for the implementation of WPT3.**

- Kate suggested discussing UU’s plan for WP T3 in two weeks’ time at sub-group meeting.

#### **WP Long Term**

- Regarding the symposium. In the last meeting with Kate, it was discussed the final arrangements for the symposium related to the Reamit partners that would be invited to present during the symposium.
- Tamiris and Xavier sent the speakers an invitation and are receiving many positive answers so far. Only Gael cannot participate as he has a final meeting of a project, but he recommended Gladys and she already accepted the invitation.
- Tamiris and Xavier prepared a list with potential external guests, from the government, climate researcher, etc. and Xavier started inviting them.
- Tamiris and Xavier had a meeting with Sasha. She explained how to create an Eventbrite link for registration of the Symposium and she sent the login details. The first draft of the registration form was created, but some improvements are still necessary.
- Information about the symposium was updated on the REAMIT Website by Sasha and once the final poster and agenda is ready, it will be included in the Website too.
- The UCD’s event manager was questioned about how to book rooms at UCD and she provided some information about the costs. However, Sasha advertised the budget can not be used to book a room at UCD, because as the University is a partner of the project the costs cannot be refunded. So, Dr. Fionnuala is trying to arrange a room with the Biorbic Centre.
- Next steps are creating the event poster highlighting the 3 themes: Economic, Environment and Social and design a formal email invitation and start promoting it.
- Tamiris and Xavier encouraged the speakers and the facilitators to participate in person.

#### **WP Management**

- Kate is still dealing with audit of the REAMIT 5<sup>th</sup> progress report that have not been completed yet. She confirmed that BED’s FLC auditor delayed the audit by 3 weeks already.
- Ram Ramanathan is leaving the University of Bedfordshire and moving to the University of Essex (UEssex). University of Bedfordshire will remain the Lead Partner of the REAMIT project and Ram will remain the principal investigator of the project, however from University of Essex. University of Essex will become a sub-partner of BED. Kate has been doing paperwork to support Ram’s transition to UEssex and involvement of UEssex as sub-partner of BED.

#### **WP Communication**

- Sasha send an update on WPC. The new Reamit website will be launched this week. Partners will be requested to provide feedback on the improvements of the website.
- Newsletter first draft will be submitted to leader partner's team by the end of this week to be published on 27 October.
- Valorial have offered to promote Reamit newsletter.
- Sasha is supporting Tamiris and Xavier with the organisation of the symposium.
- Sasha is collecting articles for the newsletter and met with Sahar and Gautam on 18 October to discuss an article about WPT2 data analytics to include in the newsletter.

**Next meeting date proposed: 2 November, at 11 am**



## REAMIT sub-group meeting, 2/11/2021

Attended by Katarzyna Pelc, Gautam Samriya, James Gillespie, Tamiris da Costa, Xavier Cama, Sahar Ahmadzadeh, Joy Eze and Sasha Bennett

### WP T1 Pilot Tests

#### Yumchop, UK

- Kate and Sasha tried to contact Yumchop for the newsletter article, but got no reply as yet. They are trying to get in touch with them.

#### HMF, UK

- Whysor had shared that both the sensors at HMF are working fine and sending data. Sensors sensed and shared data fine for at least 4 trips each. It was positive update.
- Kate shared that HMF has expressed disappointment with REAMIT. Kate met Natalie of HMF recently at kids party, and Natalie mentioned she was not happy about communication with partners at Whysor. She was concerned that we provided HMF with faulty equipment and expressed disappointment that Whysor partners underestimated the skills of HMF technical staff member (Mike). Kate was surprised by Natalie's reaction and asked Natalie why she did not communicate with Kate – project manager about her concerns.
- Kate discussed this with Ram, who advised that Natalie was disappointed as she thought we would provide a ready-made solution for HMF. She was also not keen to address questions for REAMIT LCA. Her attitude at the meeting (August 2021) with BED and UCD on LCA was unexpected. Ram suggested to wait some more time and follow up with them later on, to ask whether they would like to scale up this pilot test. REAMIT (Whysor) lent HMF 2 sensors (which are working well) and we are ready to scale up the pilot test by purchasing 50 more sensors for HMF.
- James also provided inputs regarding his experience about HMF disappointment. James and Kate discussed that probably unanswered emails from HMF to Whysor, HMF concerns about zipping and unzipping of milk bags while sensing, could be the reasons of HMF negative reactions.
- Given the above, Whysor's lack of availability to respond to emails or their attitude when communicating with pilot test partner companies (i.e. HMF) may be a risk for the REAMIT project.

**Action: Kate to send an email to HMF to discuss next steps in this pilot test.**

#### Picnic, The NL

- No updates from Imke.

#### Raman Spectroscopy, UoN

No updates from Ali.

#### WD Meats Dry Aging Chamber, UK

- James spoke with Marc and wrote a newsletter article for Sasha.
- Marc mentioned that he talked to few senior people at WD Meats about naming WD Meats in REAMIT communication materials for Dry Aging Trial. They commented to Marc after reading the REAMIT

newsletter article (draft), not to name WD Meats and use the word 'abattoir' instead, because they think the article highlighted WD Meats in negative way by exposing its weaknesses. They also did not like that WD Meats is viewed as taking external help or advice from REAMIT or anyone else for bacterial detection. Rather, WD Meats highlighted that they saw working with REAMIT team as if they were doing a favour to REAMIT, not the other way round.

- Sasha seconded it and said William had also faced similar issue with WD Meats earlier.
- It was discussed that it is a potential communication risk and we need to be careful that our partners are presented in positive way and that REAMIT communication materials don't expose their weakness.
- We compared that Picnic were happy to be named in REAMIT communication materials.
- James conveyed that Marc mentioned to him that he is asking every week for dates for next trials of Dry Aging but it looks like it would not before January 2022 when next trial could be started as WD Meats are very busy.

#### **WD Meats Clostridium Bacteria, UK**

- The Mastermix arrived at Ulster last week. James spoke with James Dooly last week. James Dilly conveyed that he would follow up with his colleague in UCD on the same day to get sample of Clostridium Bacteria. They plan to get Clostridium samples from UCD and begin trials. James did not hear back from James Dooly further as yet. James plan to go to office on Thursday or Friday and pick Mastermix kit and had deliver it to James Dooly. James Dooly also convinced a technician to work on this trial.
- James mentioned he was also working to coordinate with biomedical research centre team on fulfilling logistics needs for bacteria transportation from UCD, specially for its temperature needs during transit.

#### **Musgrave, UK**

- James gave update regarding his previous action that he was in touch with Marcel (Whysor) for sensors and Marcel is preparing sensors for trial. They plan to have cellular sensors and also looking to detect accelerometer data also along with temperature and humidity. They are also planning for alert generation due to aberration in acceleration, temperature or humidity when vans are in motion.
- Marcel hopes that sensors can be configured, programmed and tested completely in next two weeks and they can be delivered to James at Ulster for further progress on Musgrave trial.

#### **Freshdetect sensors**

- James was in contact with Matthias on 2 separate mail chains. One for Salmonella trial with Imke in Luxemburg. Another with Tahmina for appropriateness of Freshdetect sensors for fresh soft fruits. Mathias replied that Freshdetect could technically be used for both cases, but currently they were not configured for any of them. For a trial with Tahmina, Mathias advised that we would need training on new data science models for proper processing, which should take more than 2 months. James has not heard further from Tahmina following that.
- On a trial with Imke for Salmonella in Luxemborg, Mathias replied that Freshdetect could be used but it would have significant technical complexity and would need more collaboration and experimental evidence for proper work.

#### **Glen Affric, UK**

- Sasha shared that there is not much new update. She is waiting to have a conversation with Whysor on this pilot test before going back to GA and University of Liverpool.

- Sasha has tried to approach Marcel since September for conversation on sensors but she has been unable to get in touch with Marcel. Sasha aims to meet online with Imke this evening and hoped to get an update regarding the sensors. It is necessary for further budgeting as well.

#### **Pilot test at UCD, IE**

- Xavier met online with Sarah Davoren (national contact point person for Ireland in Interreg NEW Programme) and Ram; they presented REAMIT project and Cyberbar and explained the need for new companies. She responded positively and offered to try her best to recruit new companies in Ireland for REAMIT pilot tests. She was new in the position but would use her network to help. Kate suggested approaching another contact point person for Ireland if Sarah is new in her role. Kate suggested approaching Gerry Bradley (he used to be contact point person for Ireland and may be able to help) <https://www.nweurope.eu/contact-us/contact-points/>
- Xavier shared he was not sure if Sarah would attend the Symposium. Peter will attend Symposium as a policy level person.
- On prototype, Xavier said that there is nothing much work further. He was still waiting for sensors. He emailed company to get quotes but has not got a reply. He will purchase it himself to fasten the process.

#### **Pilot test at MTU, IE**

- Gautam updated that Freshbox is being used by another pilot test, so Freshbox pilot test at REAMIT would be a no runner.
- Gautam also said he was happy to provide any support to UCD on pilot tests and can be included in meetings for pilot test discussion at UCD. Xavier mentioned he will include Gautam in meetings.
- Gautam also wrote an article for Newsletter for Sasha.
- Gautam said he would try if MTU contacts at Enterprise Ireland could be used for pilot test at UCD when Xavier asked. Kate suggested Gautam to check with Pat if contacts of that time could be used. Kate also mentioned if Pat is not able to help this time, Xavier should also try to approach EI on his own and try to create his own link.

**Action: Gautam to check with Pat if we can leverage his contacts in Enterprise Ireland for developing a new pilot test at UCD/MTU.**

**Action: Xavier to approach Enterprise Ireland directly by contacting relevant persons working with agri food companies in Ireland (email/phone number should be available on EI website) to attract more companies in Ireland for REAMIT pilot tests.**

Recruiting new companies for pilot tests

#### **Blue Skies, UK**

- Kate advised there was no news from Blue Skies.

#### **E&Y, UK**

- BED team scheduled an online meeting with E&Y UK contact person to recruit more pilot test companies in UK. Kate advised that the contact person at E&Y cancelled the scheduled meeting 30 minutes before the meeting without further explanation.

**Action: Kate to send a follow up email to E&Y person to try to arrange a new meeting.**

## **WPT2 – Big Data Hub**

- Sahar shared that she tried to connect to Big Data server, but she was facing an error. She would ask Joy about ongoing port issue about connection to server to resolve this.

**Action for Sahar: Sahar to work with Joy to resolve ongoing port issue and connection to server (to resolve error she was facing for connecting to server).**

**Action: Sahar and Joy to develop an outline of the Manual for Big Data server at BED.**

**Action: Sahar to finalise the minutes of WP T2 October meeting and share it with WP T2 partners and upload it in SharePoint.**

- Joy updated that she tried to resolve the problem that Tom had while logging in last few weeks. Joy updated that the problem in accessing the server is only with accessing the shared instances but not logging in to server. Joy suggested every analytic partner should log in once a week into shared instance and their instance.

**Action: Sahar to encourage all analytic partners to access the Big Data server once a week.**

- Kate asked Sahar if she knows how to fix issue with shared instance. Sahar is not able to fix it as yet. She expressed need of support from ICT and on this. Joy shared that she sent mail to Devinder Bola and Tom for this. Joy tried to troubleshoot this but she also expressed need to take help from technical partners Tom, Devinder Bola and Gautam for resolving this.
- Kate asked Sahar if she is working on data analysis activity for Picnic data shared in earlier WP T2 meeting and would she be presenting her analysis. Sahar said that she looked at data but hasn't started analysis yet but will do this week.

**Action: Sahar to do data analysis for Picnic data and share her findings.**

- Kate shared email from Imke about HMF. We have 2 sensors installed at HMF and had 4 trips for each. Temperature data from these two sensors was shared. Kate asked if analytical partners needed more information or is this information fine for analysis of HMF data.
- Gautam said that we would need context of the data regarding the trip. Gautam also requested if the data can be shared with analytic partners.
- James added we need more inputs regarding context of the journey regarding its length, time, scheduling, what sensors were used and on what bags, etc.

**Action: Sahar to obtain more context and data in tabular form (from sensors in HMF) from Whysor. Imke shared in excel file. A small set of data.**

**Action: Sahar to ask Tom to send HMF data to BED server.**

**Update on previous actions under WP T2:**

- Sahar uploaded PPT of her presentation of REAMIT to students at BED to SharePoint.

**Action: Sahar to upload pictures of the Big Data server in SharePoint.**

- Joy connected Sahar to the Big data server as user.
- Sahar could not review the manual due to connection issues she was facing. She will have a look at the manual in coming days.

**Action: Sahar to develop a section in the manual on Big Data server on “How to connect a new person to the Big Data server as a new user”**

- Joy mentioned that James, Tamiris, Xavier already have access to server as users.
- Sahar could not follow up with Whysor to make sure data is uploaded automatically due to her connection problems.

**Action: Sahar to include in the Manual on Big Data Server detailed actions she needed to follow for different operations.**

**Action: Sahar to include in the Manual on Big Data Server a section on scripts: what are scripts, who is responsible for writing them, etc.**

**Action: Sahar to include in the manual on Big data Server a section on data route i.e. how data flows to the Big Data server from REAMIT pilot tests? Does it flow through Whysor cloud or Levstone? Or, does it flow directly to BED server?**

**Action: Sahar to explain benefits of limited and unlimited licenses for Big Data Server and present it to the data analytics partners at WP T2 meeting in November. Ongoing.**

- Kate asks who could help Sahar to solve her problems with logging in the server. Sahar shared she could connect to Big Data server until last week, but not this week. Kate suggested Sahar to try again and share error screens with Joy, Kate and Gautam. Kate asked Gautam if he can also support Sahar and Joy in resolving this. Gautam agrees.
- Kate asks Gautam about his views regarding ongoing issues with server access. Gautam said some issues during connectivity are usually common, but it will need to be trouble shoot for us to find out root cause. Kate asks if Gautam can help as colleagues previously worked on issues from Levstone has left, Gautam said he is happy to help and they can have a live troubleshooting session to analyse this. Sahar and Joy expressed willingness to include Gautam in troubleshooting.
- Kate to invite Gautam to meeting at BED with Sahar and Joy to discuss this and analyse. Kate said any other colleague also welcome to join this meeting.

**Action: Kate to invite Gautam for meeting at BED. Kate, Gautam, Sahar and Joy to meet and troubleshoot the access issue for Big Data server.**

#### **WPT3 Business Development**

- Tamiris said currently not much further update on WP T3. She uploaded Yumchop case notes in SharePoint but she is not collecting data currently. She spoke with Fionnuala last week, who asked her to focus on reviewing the use of sensors in LCA study for a proposal. She is also busy developing 3<sup>rd</sup> REAMIT Symposium.
- Tamiris updated questionnaire for Yumchop and uploaded it in SharePoint.

**Action: Kate to send email to Yumchop about REAMIT LCA.**

- Updated on previous action for James: To investigate with Joan for implementation plan for “Bringing REAMIT technologies close to the market”: James met last week with UU internal team including Professors from the Business School. He shared they had high level discussion on REAMIT WP outputs.

The Business Professor is concerned about ambition of TRL activity. They said the implantation plan need to be cautious not to oversell. They were of view that an aim of TRL 3-4 was more realistic given the timeline and resources. TRL 5 is when the technology is applied to at least 100 companies, TRL8 is when it is fully commercialized. We need to be more realistic on the aim of this activity.

- Regarding Food waste: James mentioned he was referring Tamiris work on LCA and relying on other UU staff for their experience on further direction. James mentioned that Trevor can leverage industry contacts for this but again we need to be more realistic. James suggested a discussion on the agenda and outputs of WP T3 with Kate, Ram and Tamiris.
- Kate asked if we can have the next WP T3 online meeting before end of the year. James suggested we can have it in November.

**Action: James to prepare draft agenda for WP T3 meeting and a set up a date for the meeting at end of Nov 2021.**

**Action: James to prepare mailing list for WP T3 from colleagues of UCD, UU, BED and NTU.**

#### **WP Long Term**

- 3<sup>rd</sup> REAMIT Symposium: Tamiris shared that posters are completed and ready. They are aiming to promote the Symposium at UCD. They have also approached UCD communication team for promotion.
- Tamiris shared that out of all invitations, so far 11 response were received. Out of these 6 would attend in person and 5 online. Among speakers, some external guest yet to confirm. Minister for Agriculture has been invited, not they have not confirmed yet. Richard Bruton, another politician Ireland had expressed interest and replied positively, but he is also yet to confirm. Tamiris and Xavier updated about list of invitees, speakers including external guest and their confirmation status.

**Action: Xavier to send more emails to potential guests.**

- Kate asked if Xavier got any chance of contacting Investment firms from the list that Kate had shared with him. Xavier shared he did not approach and needed more understanding. Kate explained that investment funds investing in innovative agri food companies bring in additional capital for these companies to develop their technologies.
- Kate stressed the need to promote Symposium more aggressively as only 11 attendees have confirmed their attendance so far.
- Kate also suggested approaching Sarah (point of contact for Ireland for Intereg) and Enterprise Ireland for promotion of Symposium in their networks.

#### **WP Communication**

- Sasha updated about her activities on previous actions and new activities. Sasha shared that the new Reamit Website has been launched and its using the same domain.
- She received positive comments from BED on the new website and request other partners for feedback as well.

**Action for all: Review the new REAMIT website and provide feedback at the next sub-group meeting.**

- On newsletter, Sasha shared that it was to be published by last Friday. They heard from Glen Affric on their updates, however, they did not hear back from Yumchop and thus could not publish the

article on Yumchop in newsletter. Sasha said that now we need to decide to skip Yumchop article from current newsletter and go ahead with publishing the newsletter without it.

- Sasha working for promotion of the REAMIT Symposium.
- Valorial promoted REAMIT: Valorial featured REAMIT in their newsletter and included about REAMIT in their event as well for the promotion. They featured article about HMF. As we had decided to keep a low profile on HMF due to their silence, we need to be careful about not giving wrong message.
- Kate suggested taking it as a lesson that Communication strategy and actions for each external partner should be carefully drafted for each partner individually according to their independent situations.
- Kate asked Xavier if the venue for Symposium is confirmed. Xavier said not yet confirmed. Tamiris sent a follow up mail for confirming a place in UCD but got no confirmation.

**Action for Tamiris and Xavier: To finalize the venue and agenda for Symposium and update Kate and Ram by end of the week.**

- Regarding case studies: Presentation for case studies for Symposium were sent out. Pending on asking questions for Yumchop. Work on HMF has been kept on hold due to current situation.

**Action for Kate: To ask Yumchop questions identified for the case study.**

#### **WP Management**

- Kate shared that there was a mail from the funder requesting many clarifications about REAMIT project 5<sup>th</sup> progress report. Kate is working with affected partners to clarify these.
- Kate shared there is no news on REAMIT 12-months extension budget.
- Kate said she is expecting that payment and confirmation on REAMIT extension would be made after clarifications have been sent to JS.
- On 1/11/2021 Ram started to work at University of Essex and shared his new email address.
- It was decided to have this subgroup meeting for max 1.5 h going forward.

**Next REAMIT sub-group meeting to be scheduled on 16 November 2021 at 11.00 am.**



## REAMIT sub-group meeting, 16/11/2021

Attended by Katarzyna Pelc, Gautam Samriya, James Gillespie, Tamiris da Costa, Xavier Cama, Sahar Ahmadzadeh, Joy Eze and Sasha Bennett

*Kate mentioned that at the last meeting, we agreed to finish subgroup meetings within 1h30m.*

Kate is meeting with Xavier today at 12:30 to assist him in preparing to approach potential pilot companies in Ireland – Ram is also going to attend. Anyone else who is interested in attending can.

### **WPT1 Pilot Tests**

The monthly WPT1 meeting was held yesterday (15/11/2021) which all subgroup members attended. Kate asked if there were any updates since the meeting. Sasha, James, and Xavier all confirmed they had no further updates.

Kate said that Natalie from HMF is now very responsive to emails, and she would like to go forward with 10 new sensors for the HMF trial. Kate is waiting on word from Imke on what sensors should be purchased.

**Action: Gautam to check with Pat if we can leverage his contacts in Enterprise Ireland for developing a new plot test at UCD/MTU.**

- Planned meeting this week between Pat, Xavier, and Gautam.

**Action: Xavier to approach Enterprise Ireland directly by contacting relevant persons working with agri food companies in Ireland (email/phone number should be available on EI website) to attract more companies in Ireland for REAMIT pilot tests.**

- Xavier hasn't done this as he already spoke to Sarah – she asked him to avoid duplicates as she had already contacted some people in the Enterprise Ireland network.
- Xavier also wanted to ask Pat and Gautam before going forward on this action.
- Kate asked if there is anyone due to attend as a speaker from EI at the symposium, or if Xavier has approached anyone to ask them if they would like to be a speaker at the symposium? Xavier said neither at present. Kate recommended that Xavier try to organise someone from EI to join the symposium and present as they are a very important and respected body in Ireland and thus would be a good addition to the symposium lineup.

### **WPT2 Big Data Hub**

**Action for Sahar: Sahar to work with Joy to resolve ongoing port issue and connection to server (to resolve error she was facing for connecting to server).**

- Sahar said that every day she is checking the connection and the SQL server and there is still a problem.



- Sahar explained that she is quite new to SQL, and that Joy, Gautam, and herself have had meetings for troubleshooting which are ongoing. Joy was in contact with Microsoft support and Lohit to try to resolve connection issue. She is also working with Andrew at Beds.

**Joy provided details about the issue**

- Joy, Sahar, and Gautam – 3 persons involved in debugging. After running the weekly update on MSSQL as prompted / part of security measures, problems have arisen. The team discovered after updates MSSQL could not open again on the REAMIT server. Gautam joined and tried to get it working. Part of the problem is that the parent folder is not visible on the server. The team have tried a number of solutions to bring it back – but have not been successful so far. Joy didn't have access to all the info she needed so had to contact Lohit again. Lohit responded that there has been a death in his family so he is busy for the next few days but would reply with the requested information ASAP. Both Lohit and Rams email have been deactivated, which were the two email accounts associated with the SQL server registration. The team therefore do not have login details yet.
- Kate will discuss tomorrow with Ram at her monthly update meeting with him whose email addresses should be replaced on the SQL server instance. She suggests it will probably be herself and Sahar added to the account registration.
- There is an option to involve Davinder and Wayne from Levstone to help with debugging – there could be an old config file somewhere which could be used to get the server working again.
- Gautam asked Joy if she contacted Microsoft support team yet as he was not copied in on the emails. Joy told Gautam she had contacted them, but she doesn't have access to all the details they are asking for – which is why she has had to write to Lohit. Microsoft require details of the previous purchase so they can put the REAMIT team in contact with the correct support team.
- Gautam understands that the problem is with a registry file which was replaced during a server update, but will need assistance from others (e.g. Microsoft) to resolve.
- Joy asked if it was worth engaging with Davinder before Lohit replies. Kate said that Lohit should reply by the end of the week but she could contact Davinder beforehand if needed.

Sahar has completed the WPT2 minutes and uploaded to SharePoint. Kate asked if Sahar shared the minutes by email (not many people check the SharePoint.) Sahar said she had not emailed partners the minutes yet.

**Action – Sahar to send email to all WPT2 members with the minutes.**

**Action: Sahar to encourage all analytic partners to access the Big Data server once a week.**

- Kate suggests that once the SQL server is working it should be checked once a month at WPT2 meeting by all partners.

**Action: Sahar to do data analysis for Picnic data and share her findings.**

- Sahar said she has already done some and included it in powerpoint given at WPT2. She is going to add some results for HMF which she will explain in the WPT2 meeting on 23<sup>rd</sup> Nov 2021.

**Action: Sahar to obtain more context and data in tabular form (from sensors in HMF) from Whysor.**

- Imke has since shared HMF data in excel files (4 journeys worth). Gautam mentioned that the previous discussion here was that we would need more context to the data so that we can do better / more meaningful analysis – this is still the case. We need to obtain length of journey, sensors used/ tagging information.
- Kate asked the following: How do we approach data analytics– what do we do / what further information do we need in order to successfully analyse? Kate recommended that we need some short guidelines for how to approach data from HMF, to provide more context for the data.
- James suggested that a list of requirements and a clear outline / plan for each pilot should be created in order to help identify what further information will be required outside of sensor data in order to create alerting systems / perform analysis.
- For example, the end goal of the HMF trial is that an alerting system will be developed so that HMF know when the temperature of the bag goes above -10 degrees C.
- The REAMIT team will need to know schedule of bags, or perhaps add an accelerometer / contact sensor on the zip to know when the bag is in motion / when the bag is open.
- A guidelines document will need to be created for each trial.

**Action: James, Sahar, Gautam, and Kate: As prep for WPT2 meeting on 23<sup>rd</sup> November 2021, prepare a draft of guidelines for analysis of data from HMF and present to other partners. James to work on initial draft and send to internal team before presenting at WPT2.**

**Action: Sahar to ask Tom to send HMF data to BED server.**

**Update on previous actions under WP T2:**

- Sahar to upload pictures of the big data server in SharePoint - complete
- Sahar and Joy to develop an outline of the Manual for Big Data server at BED – draft outline complete

**Action: Sahar and Joy to develop an outline of the Manual for Big Data server at BED.**

- Kate suggested Sahar show a draft of the manual outline to partners attending WP T2 meeting.

**Action: Sahar to present to partners at WP T2 meeting guidelines on how to approach data from HMF.**

### **WPT3 Business Development**

- Kate to send yumchop email about LCA. She is going to meet with them next week to discuss the REAMIT dashboard and will mention the LCA at this meeting.
- James has organised the WPT3 meeting for tomorrow. He has organised a WPT3 mailing list. James met with Xavier and Tamiris last week to discuss deliverables and the agenda for this meeting. He will send a draft of this agenda out before end of day to Kate, Tamiris, and Xavier for review.
- Tamiris said that Natalie will send the results from LCA at HMF that she is doing with another University, however this will probably only come once its published as the type of data is sensitive.

### **WP Long Term**

**The 3<sup>rd</sup> REAMIT Symposium is now taking place online from UCD**

- Tamiris said that due to covid situation in Ireland, Shane and Fionnuala discussed it and decided to revert to online event only.
- Regarding speakers, we just have 2 free slots left. Tamiris said we can give speakers some extra time if we don't get anyone to fill these.
- 128 people registered for the symposium – 85 on Eventbrite and others are confirmed /invited speakers who have accepted but haven't registered online yet.
- Xavier has sent emails to Colin Gibson and 'Too good to go' to see if they will join the symposium.
- Sasha pointed out that the poster still says Dublin, which could be confusing – she asked if this could be updated to say online only.
- She also noted that there are more details on the website about the event than on the Eventbrite. Sasha requests that perhaps the Eventbrite page can be updated to reflect this
- Kate asked if any of the investment funds accepted the invite? Xavier said that no, he did not get a reply to the email. Kate suggested he send an email to 3 or 4 investment funds at once as she would like at least one investor to speak at the Symposium. Xavier said he contacted the investor already working in agrifood. Kate told Xavier that all of them are involved in agrifood.
- Kate suggested she can send Xavier a line or two that he can include in his intro mail to the investors which will highlight the benefits to them making a presentation at the symposium.

**Action: Kate to send to Xavier a line about the proposed focus of the presentation delivered at the REAMIT Symposium by an investment fund.**

**Action for Xavier – contact the other investment funds. Once they respond Kate to help refine the focus of their presentation.**

- Sasha asked Tamiris about the online platform they intend to host the symposium on: zoom or Teams? Sasha recommends having IT support on hand from UCD. Tamiris said she will probably use zoom as they have had some issues with Teams.
- James said that you need to set it up as a webinar on zoom if you are having more than either 50 or 100 participants. This is a premium feature but you might already have access to it. Tamiris said that she thinks they do. Sasha pointed out that Kate also has a premium account from BED if UCD don't.

**Action: Tamiris to send out most up to date agenda for symposium.**

#### **WP Communication**

- Sasha presented the new REAMIT website for quick feedback.
- Tamiris said the tab buttons are a little small.
- James said that the text on call for participation in technology demonstrator page looks very small on his screen. Sasha said it is size 12 but she will increase the size.

**Action for all: Review the new REAMIT website and provide feedback at the next sub-group meeting.**

- Kate asked about the old website. Sasha said they moved the reamit.eu domain to the new website but the old website is still accessible through the nweurope page.
- Ram mentioned that there is no link between the two websites. The old website should highlight that there is the new website with more info. Sasha said she will interlink the two websites.

- Sasha said that (due to travel restrictions) she will be requesting Frank at Picnic to capture video footage of the trial so she can create our own pilot test video from that. She hopes that within the next few weeks we will have a new video for REAMIT.

#### **WP Management**

- Pilot partners are to be asked to participate in the next steering committee meeting at Ulster in January: WD Meats, Musgrave, Glen Affric, etc.
- Sasha requested that Kate to send out Eventbrite link again to all partners as only 5 people have responded so far.
- Deadlines will be a bit tighter this time for the next reporting round. Next reporting round cannot be started until the previous report has been fully approved.

**Next REAMIT sub-group meeting to be scheduled on 30 November 2021 at 11.00 am.**

## REAMIT sub-group meeting, 15/12/2021

Attended by Katarzyna Pelc, Sasha Bennett, Joy Eze, Gautam Samriya, James Gillespie, Tamiris Da Costa and Xavier Cama.

### WPT1 - Pilot tests

Running pilot tests:

Most partners participated in the WP T1 meeting earlier this week (13/12) so updates for T1 were brief. Quick overview was as follows:

- The sensor for the Musgrave trial arrived and James was able to put the batteries in it and it is working fine.
- Marcel set up a test dashboard page and James said that the login is working fine from his house. James had got temperature and humidity recording every five minutes and the next stage is to put the sensor in his car and drive around the Belfast area where the deliveries take place to ensure that the connectivity does not drop on the delivery route as happened with HMF.
- Marcel is working on with the manufactures to get the accelerometer data integrated into their platform, which James will use for the algorithm that he is going to develop for Musgrave, but it is still in progress.
- No further updates for dry aging and Clostridium pilots.
- Kate: For Yumchop, all the sensors are working well.
- For HMF, Kate has got an update from Whysor that there's no data coming from the sensors and it looks like sensors are off because they try to save on batteries (there were only data for 3 or 4 days). The sensors were showing room temperature, and they were not sent on any trip.
- Kate will have a meeting with Blue Skies early in January because they want to go ahead with the pilot tests.
- There is shortage of sensors worldwide, so Whysor is struggling to buy sensors and there are no sensors in stock in their suppliers. The one supplier they had said there were 40 sensors and they had to make a decision by yesterday.
- We got all the permission at BED to purchase these sensors, so the sensors for HMF and Biogros are secured. James is also purchasing the sensors.
- On 14 December 2021, Kate attended the German network, Trust and Trace, who are doing similar things as REAMIT, tracing transportation of food with the use of Blockchain, and they were very interested to explore possibilities for collaboration.
- As a follow up of her presentation for Trust & Trace Network, Kate will have an online meeting with Ram on Friday (17/12) with a Dutch company <https://cargolodger.nl> involved in the Trust & Trace network to explore possibilities for cooperation.
- Sasha: Update from Glen Affric, Imke indicated that she made an overview of the next steps with this pilot test. Dan and Trevor have sent a presentation to demonstrate how the sensors will work and the next steps will be meeting with Jumo (the manufacturer for the sensors) by the next weeks to define the details and the requirements of the sensors.

- The following step from that is to get the final quotation and make the payment by January. After that, they will go through a few more process with the configuration of the sensors with Whysor.
- Xavier: There was an exchange of emails with Tahmina on 3D fluorescence and a meeting on 14 December 2021. On Friday, 17 December 2021, Xavier and other REAMIT partners will attend a meeting with Matthias Heiden from Fresh Detect, to ask some questions about this sensor. Some work is necessary before Fresh Detect sensors can be used in REAMIT to detect certain types of bacteria.
- Gautam contacted a Circular Bioeconomy Research Group; they are working for some pilot tests already and he is exploring some opportunities for involvement of Reamit technologies into their work and they liked the Reamit idea.
- Gautam approached the co-founder of the Food Cloud by email and she also expressed initial interest in exploring it further. Gautam is planning a meeting with her by the next weeks.
- Gautam mentioned that earlier he was approaching companies, but they were not responding. At this moment the companies stated responding positively.
- Based on an update from Imke about the pilot test in the Netherlands and Luxembourg, we assume that everything seems to be going ahead with these pilots.
- Xavier mentioned that from those contacts that were initiated, he is still talking to a team called Sligo Enterprise and they have contacts in the Northwest of Ireland that they will approach. Ram suggested having a meeting with all of them.
- Kate hopes that after the 3<sup>rd</sup> REAMIT Symposium there will be also response from some more potential pilot companies.
- There will be a meeting with Mathias this Friday (17/12/2021) with James, Whysor (Imke and Julian) and Tahmina to discuss in which environment and company they would like to use the sensors and how they would like to involve Matthias. According to James, they are looking to detect two very specific types of bacteria, Salmonella and Listeria. Matthias believes that there is potential for it, but he is not sure about the sensitivity of the fresh detect sensor to be able to detect specific types of bacteria.
- Gautam and Xavier met and discussed a few main outlines and critical points for the POC pilot tests between MTU and UCD. They discussed some issues regarding the selection of fruits and vegetables for the pilot test and some intermediate locations where they can simulate redistribution of the food and shared it with Shane.
- Kate asked Gautam and Xavier to write about these plans in their reports and present it during the Reamit meeting in January.

#### **WPT2 – Big Data Hub**

- Joy mentioned that over the past month she and Sahar worked in company of Gautam to solve the problem with the Reamit server. They reinstalled the management studio, which enabled analytic partners to be able to do the analysis.
- According to Joy, at this moment the partners can connect and would be able to do that successfully, expect if there are minor issues with connection. However, she hasn't been able to receive any feedback on the connection status.

- James tested his connectivity and when he had an error, Joy was able to fix it for him and he could attest that his connectivity was ok right now.
- Gautam was requested for a password reset and they did it after resolving the error.
- Joy noted that for two days there is no new data on the database, and she will check up the status of everything with Whysor.
- Because of these delays, Joy doesn't know if someone is really working on how to get the scripts ready to transfer the data from Whysor database into the shared instance.
- Joy had a prolonged issue with Ram login access because he changed his credentials and it interfered his login status. They followed up on Microsoft Support Team and this issue was resolved now.
- Yesterday Kate met with Whysor online and Tom confirmed that he was on holidays, so he did not push data from REAMIT Whysor cloud to Big Data server, but he promised to start putting data in the server for all the partner to do analytics.
- Ram suggested sending an email to Whysor requesting them to push the data once a week on Wednesdays, but Tom will try to automatize it.
- Kate mentioned that Tom noticed an issue with VPN and he is having some challenges to access the server. Joy will try to follow up on this with him to try to solve it.
- According to Kate, Imke looked at the dashboard and there's no data coming from Human Milk foundation, but there is data coming from Yumchop.
- James believes there is potentially missing data or data that we are not collecting that we should be collecting from HMF and we need to have a clear meeting to understand their needs so we can then provide the correct equipment or collect the necessary data.

### **WPT3 – Business Development**

- Tamiris had a meeting with Abi from Yumchop last Friday (10/12) to explain the LCA task. Kate attended the meeting too.
- During the meeting Abi explained the processing steps in their factory and Tamiris got a better perspective about their life cycle.
- No quantitative data were collected during the meeting because Abi needs to check upon the records.
- Tamiris presented the questions and the data requirements to start the LCA study. Since Abi was unable to address all the questions, Kate suggested splitting the questions over the next meetings. Kate proposed a sequence of meetings, 1h per month to work on the LCA task with Yumchop.
- Tamiris sent the first table with the data requirements to Kate and she is waiting for her feedback before forwarding it to Abi.

### **WP Communication**

- Sasha is preparing the December newsletter and Kate asked about her thoughts and ideas for the articles.
- The first highlight will be an update on the symposium showcasing the guest speakers and a few bullet points on some of the highlights from the symposium.
- Kate mentioned about the presentation of Peter Campobasso and Sasha asked if she wants to mention about his presentation in the newsletter.

- Kate believes that there were some good materials in his slides showing different aspects of food waste policy at EU level.
- Kate suggest having an article about the next Reamit meeting in the newsletter, an announcement with the dates and the venue.
- Kate will prepare a short article about the meeting she had on Monday with Trust and Trace network. Sasha will try to combine it with the article from Valorial.
- Kate proposed an article about the investor (investing in innovative agri food companies) presentation at the Symposium to show the investors angle.
- Sasha also expects an article from Ali Assaf about the new Raman spectroscopy and the development that they have at the University of Nantes.

#### **WP Management**

- Kate has been involved in the paperwork for Ram's transfer to Essex.
- Kate has worked on additional REAMIT report and claim 3.3 as two partners were not included in the report and claim 3.1, and they will not get the money until the next report is submitted. This is due to a mistake when Kate submitted all reports through eMS and reports which were previously reverted to PPs, were not re-attached in the project claim. Kate is working with the partners concerned, their FLC auditors and BED auditor to organise an additional audit of REAMIT special report 3.3.
- The deadline for the new report 3.2 is Friday 17/12.2021, but some partners already told Kate that they would not make it because of these challenges with special report 3.3.

#### **WP Long Term**

- Kate congratulated UCD team for organising a very interesting, high quality REAMIT Symposium. She believes the sessions were of very high quality and the discussions were very interesting. She would like to encourage UCD team to write a note for the next REAMIT newsletter about the impacts of the symposium, concrete meetings arranged as a follow up of the Symposium, new pilot tests because of the Symposium, engaging with investors, etc.

**Action: For UCD and all partners: write a note for the next REAMIT newsletter about the impacts of the symposium, i.e. concrete meetings arranged as a follow up of the Symposium, dialogue initiated on new pilot tests because of the Symposium, REAMIT partners engaging with investors, etc.**



## REAMIT sub-group meeting, 12/01/2022

Attended by: Gautam Samriya, Katarzyna Pelc, Xavier Cama, Sasha Bennett, Joy Eze, James Gillespie

### WPT1 – Pilot tests

- HMF have agreed to attend the RAC Meeting and scale up the pilot test. Natalie would like to meet to discuss the focus on data analytics approach for HMF. Sahar to send out the invitation for this meeting on Friday with data analytics partners. HMF will be installing 10 new sensors.
- Blue Skies – UK based companies, producing and transporting fresh fruits – chopped and packaged, to be sold in major UK supermarkets. The plane sometimes has to stop in Qatar and other hot airports, and during this time they cannot control what happens to fruits. The temperature gets too high and the food is then spoilt by the time it arrives to its destination. They would like REAMIT to set alerts to let them know when temperatures are too high. Meeting this Thursday with Whysor to discuss how this idea will work, how to monitor temperature of food during transit. The challenges faced would be internet connectivity across the globe.
- Email from Whysor received that Yumchop data has stopped being received since 10 January 2022. So will need to contact Yumchop about this.
- Glen Affric – we met this them last week with JUMO, a sensor provider based in the Netherlands to provide the sensors for Glen Affric. Whysor and NTU also attended. Whysor discussed exactly what sensors will be required after discussing with Glen Affric and JUMO. NTU to soon start the procurement process. The final cost of sensors will be defined shortly. 2 temp sensors, 2 thermowells and some additional fittings, totalling around 4,300 euros from the initial quote from Jumo.
- Musgrave – 4 Extra loggers have been ordered through Digital Matter, by Marcel at Whysor. These are currently kept at Whysor. James will have to install these. Sensors have been ordered and will arrive at the university in the next 3 days. Some point February, this trial will launch. Algorithm being developed by Marco at Whysor with Digital Matter. GPS signal will be used while in motion. Accelerometer will trigger the GPS readings. When in motion it will send sensor readings every 5 minutes.
- WD Meats – hopefully at some point in January we should get the Dry-ageing trial up and running. James has suggested to Marc at WD Meats to contact him to let him know when in January to get started.
- James Dooley is still difficult to contact for the clostridium samples, Joan has suggested to get in contact with Ruth and James will still continue to chase James Dooley about getting the samples.
- James expressed his concerns about the Fresh Detect sensors for the 3DF trial. Matthias indicated that it may be possible to get a successful result but will take a lot of time and effort. Ram has said this will be too much risk, outside the scope of the project. So that area of exploration has been shut down. Joan suggests for James to talk to William, but this has not been successful. Kate suggests having a separate meeting with James about this, as it is more complex than initially imagined. Kate suggests this maybe beyond the scope of this project, but James has been invested for so long, so we must create a document to have some evidence of the work that's been done so far.

- **Action – James to provide a 1-page summary of his findings and what he’s being doing with 3DF since starting this role with Ulster; and to find out from Tahmina to let us know what she has been doing and her findings using 3D fluorescence, although outside of the project.**
- UCD – Xavier is currently having doubts about what to do with the Freshbox idea, and what products to use. He will clarify this with Shane. Xavier will have to source a vehicle through UCD or a van from 3<sup>rd</sup> party.
- Kate announced that we will close the search for new pilot tests. What we already have will stay but no further pilot tests will go ahead. A message has been received from the funder.
- Xavier mentioned he had a meeting with Slygo Enterprise, In Northern Ireland, about a potential pilot test.

#### **WPT2 – Big Data Hub**

- Since December, Whysor has been pushing through data to the Big Data Server. No issues so far other than granting Whysor access to the cloud server. A challenge being faced is the way the database was created, Whysor collects the data and the script transfers the data into the shared instance where everyone can view this data. Each time Whysor updates the table, Joy is unable to get the extension direct to share instance easily and having to delete the previous database to upload the new one that’s been updated. Kate suggests for Gautam to have a phone call with Joy to assist with this.
- Sahar to send information about the upcoming data analytics meeting, to prepare for the meeting with HMF for Monday 17<sup>th</sup> January. All partners involved in data analytics to attend. Sahar to come up with a proposed structure of what to look for in the data analytics for HMF. Kate suggests we can look at a similar structure for Yumchop also.

#### **WPT3**

- No updates on this.

#### **WP Communication**

- Delay to release the December Newsletter, this was published at the beginning of January. This has now been published. It is also appropriate to release a January newsletter by the end of January, to focus on the RAC/RSC Meeting and other new developments. Sasha expressed concerns in lack of responses from partners. Kate suggests for Sasha to look at the reports from December and write articles based on this, rather than waiting for input from partners, this may save some time.
- **Action: Sasha to send email to Ali at the University of Nantes, chasing for an article from the previous newsletter. Cc’ Kate and Kate will follow up if there is no response from Ali.**
- **Action: Gautam to develop an article with Sahar about the WPT2 focus on data analytics for the upcoming January newsletter.**
- The main focus of the newsletter will be updates from the RAC/RSC/WP Meeting, the missed article from Ali at UON, article from Alexander Kalis on investments.
- Sasha mentioned the development of infographics in German and French translation, this will be developed with Whysor, Image and Reseaux and Valorial. This should be ready by the end of January.

- Picnic video – Picnic were unable to provide video footage around Christmas so it was no point developing the animated video with any substantial content. Sasha suggests it will be worth contacting them again to request for new video footage to develop a new video for Picnic.
- Kate suggesting for Sasha to adjust the preview of the images in the 'Events' and 'News' section – the images appear stretched and needs to be adjusted on the website.

#### **WP Management**

- James has sent out invites to speakers and contributors for the upcoming RAC/RSC Meeting. James asking for assistance from subgroup to take minutes, suggests its easier to have 1 person taking notes for each session.
- Action – James to assign responsibility for minute taking, assign roles for each session.
- James will be responsible for time management of the Project meetings and emails must sent to speakers ahead of the meeting to send their slides in and upload to Sharepoint.
- Money will be released to partners this week from the completed claims.
- 2 reports were incorrect and were re-opened which caused an issue in EMS. We cannot reopen a report that has already been certified, so this is what caused the problem. This was the case for NTU and Whysor.
- Kate is currently preparing a consolidated project progress report.
- Kate, Ram and Yan have worked on addressing funder's questions regarding the REAMIT project 12-months extension budget. They require more information and justification of the project extension budget.

Date for next meeting proposed – Wednesday, 2 February 2022.

## REAMIT sub-group meeting, 2/02/2022

Attendees: Katarzyna Pelc (BED), Sahar Ahmadzadeh (SA) (BED), James Gillespie (JG) (Ulster University), Gautam Samrriya (GS) (MTU; IT Tralee), Joy Eze (JE) (BED), Tamíris Da Costa (TD), UCD

### Apologies:

Xavier Cama (XC), UCD

Sasha Bennett (SB), NTU

Meeting date and time: 02/02/2022, 14:00-15:00 pm (UK time) (Online via Zoom)

### WPT1 on pilot test

KP updates:

There were some issues with false alerts in Yumchop.

### For HMF:

- Two meetings with data analytics partners and the HMF team were organized on 14<sup>th</sup> and 17<sup>th</sup> Jan.

Thanks to JG for sending emails.

- KP is in process of purchasing the 27 sensors that IH requested.

Asked for clarification from JG if she should send details for suppliers in south Africa?

JG:

The problems with loggers, Whysors ordered all of them.

Ulster ordered only 4 of them. JG is not sure how many is needed for BED.

According to the invoice, JG is looking at invoices.

BED already paid for 30 and Whysor paid the rest.

Whysor already ordered all the sensors needed.

JG already emailed Andrew and was in contact related to creating invoices.

**Action JG:** To send an email to Andrew relating to the invoices

IH requested to Arrange a meeting

KP: To send an email to IH

### Blue Skies:

SA update:

Update summary of Blue Skies.

- Hella Action: should provide some tours and videos.
- KP Action: Should provide some signed agreement, they have to mention which kind of sensors are needed.
- KP asked SA to take lead for Blue Skies

**SA Action:** To be the leader of the Blue Skies pilot test.

### WD Meats Dry-ageing trial:

- JG spoke to Marc on Monday this week. The chambers are being deep cleaned this week so they cannot start the trial.
- Marc said to JG they might be able to start next week, if not hopefully the week after.
- Marc is pushing for the trial with his Manager. JG is now texting Marc once a week to remind him about the trial.

#### **WD Meats Clostridium trial:**

- UCD finally extracted the clostridium bacteria from their fridge in January to discover the bacteria had died.
- UCD recommended James Dooley order the clostridium DNA instead. James Dooley has told JG that 2 DNA samples will be required at approximately €150 per sample. He said he would provide further details for ordering the samples, but JG is still waiting. JG followed up with JD last week and has not received a reply yet. He will send another email this week.

#### **Musgrave:**

- IH has posted the 4 new loggers to JG yesterday. They should be arriving with him by the end of the week.
- JG has ordered the temperature sensors which need to be wired into these loggers from Farnell and they are in the office waiting for him. He will collect these before the end of the week.
- JG has worked with Marco on testing the sleep/wake and trip detection algorithm of the sample logger he has at the moment. Everything is working as expected.
- JG hopes to launch the trial W/C on 14 February.
- JG has written an email to Marco and Tom proposing 2 separate algorithms for monitoring time elapsed at the start of a journey. These will allow the van to cool down appropriately before sending alerts. The algorithms would also be beneficial to the HMF trial.
- JG is waiting to hear back from Whysor on his proposition.

#### **HMF:**

- JG spoke with Marco yesterday about the use of binary sensors on the HMF trial.
- JG picked up a binary sensor from Ulster yesterday and has emailed Marco about adding it to his device for testing. If it works as planned JG can proceed to help select sensors for Beds to order for the trial.
- KP asked JG if he could come to HMF to help set up the system, as he volunteered in an email. JG said he would be happy to if required.
- IH requested a meeting with GS, Marco, TV
- Natalie was not happy with the weight of the sensors which were more than half a kg.
- JG: Thinks DB is not needed to be involved in HM trail.
- DB is proposing a different system that is not really for HMF. The system relies on Android while not everyone has access to Android phone.

#### **KP Action: To try to understand what is DB's plan for HMF.**

#### **3DF pilot test**

- Fresh detect is under investigation and will be provided with more updates next time. JG sent an email to IH. They don't know how it works on specific surfaces, so it is under investigation. JG suggested on the sealed packages of chicken. JG guesses Jipsy results are not promising.

**KP Action: Arrange a meeting with Jipsy. Will arrange a meeting to discuss how she performs a test. Also, be in contact with TA.**

#### **Glen Affric**

- There is no update currently available from SB.

#### **UCD pilot test**

- XC has some updates. He sent an email as follows:
- Had an initial phone conversation with Frank at Lurgangreen Shellfish last week.
- Another company ( an abattoir) that was interested has not been responsive so there has not been initial talks nor acceptance to a zoom meeting. I am going to send a reminder to try to see if I can push it a bit.
- Contacted (yesterday) a person at the Donegal county office.
- Did some preliminary testing for the POC trials but the sensor was not working properly.

#### **WPT2**

SA updates:

- SA and JE worked together to see the updates from the pilot test.

They are checking new data coming from different pilot tests.

- JE: Pushing data is still manual.
- Made the contact with ICT and Andrew.
- Create an RDP request to give him access.
- JE created an account for TV and he will update if his connection is working.

**Action: JE** to follow up with TV to see if he can push data automatically

SA:

- Some updates for data coming from Whysor to the shared instance: HMF, Biogros, WDmeats, Yumchop, PicNic, Glan Affric
- The problem of not being able to automatically update the shared instance was discussed.

JE arising an issue for transferring data from one server to another server.

- TV may have a script to do it.
- JE created account for TV.
- TV has not confirmed using it.

**JE Action:** to chase up TV to see if he is doing it manually or automatically.

**JE Action:** How to update from one table into another table in another server.

- There is one line error that needs some further investigation.

Expertise needed: database administrator.

- GS: Can help JE, but he needs some admin access to look at the edge.

JE: To set up a meeting with JE, JG, and SA.

**Action: JE** to coordinate with other partners to see how to update the table into another table in another server.

DB maybe alright to help. So, he can be added to the mailing list to discuss the issue with him as well.

**JE Action:** To set up a meeting to coordinate to solve the issue with the help of other partners.

- SA provided updates related to writing up a user manual.
- SA: Downloaded word files related to users' access to the server.
- SA: Explained the issues she had to have remote access to the server.

**Action: SA** to send the draft version of the user manual to Yan, Ram, WPT2 a week (Big data hub user manual)

- The table of content and the introduction is already written.
- It can be sent to JE first.
- To work on the user manual in the next two weeks.

**Action: SA** to work on the user manual and send the draft to JE, in 12 days to look at it.

- SA to organize a meeting with analytics for Yumchop data analysis.
- First Organise a meeting with Data analytics partners related to Yumchop data analysis.

**Action: SA** to send doodle pool after 7<sup>th</sup> Feb or week commencing 14<sup>th</sup> Feb.

**Action: SA** to contact KP, RA, asking for support in progress the purchase of license.

**SA Action:** To send the minute for meeting on 14<sup>th</sup> and 17<sup>th</sup> HMF to data analytics partner

**SA Action:** To set up a meeting with UESSEX, and BED about discussion about licensing order

- Write up a list of people who need access to the server before meeting with BED and UEssex

(All the analytics partners)

**Action SA:** Contact RR, YD, KP asking for support with progressing the purchase of license for data analytics.

### **WP3:**

- TD: Had a meeting with Abi and prof UR.
- TD: Already installed the software, but do not yet have access to the database. Only data for rice and chicken are available.
- TD: To send an email to request a visit to the factory
- TD: Contacted IH to see the impact of sensors info; number, type of sensors, type of suppliers...
- She may be able to find out the material which is required to put the sensors on the website.
- TD has clarified some questions with Yumchop in a meeting between her and RR.
- Abi had no access again to the recordings.
- The meeting focused on their main products - she will send TD the data for rice and chicken.
- They discussed the best option to collect the data, and it was agreed that they would send data by email.
- Abi promised she would have the questionnaire completed by last Friday but TD hasn't heard anything yet.
- TD has followed up. RR has suggested an in person meeting for TD - Finnouala has agreed – TD will try to collect over mail but will visit in person if required.
- TD contacted IH for further info on sensors installed at Yumchop - number, sensors, suppliers.

So, she can look into materials used to produce them.

- TD asked IH if she could post the broken sensor from the picnic trial if it is similar to the ones being used at Yumchop, so she can examine the materials (so there is no fear of breaking a working one). JG offered TD a broken LoRaWAN Ursalink UC11-T1 from the Dry Ageing trial which may be more similar to the sensor installed at Yumchop. TD will provide JG with a postage address.
- TD has no updates for the Yumchop case study.

#### **WP Communication**

- KP asking for promoting newsletter on LinkedIn, and social media.
- JG has set up a meeting between communication partners, KP, RR, and Joan with Type40Creative, a company Ulster previously used to produce a documentary.
- The meeting will be on 10th Feb.
- KP suggested an internal meeting should be held before meeting with Rich to ensure all partners are on the same page.

#### **WP Management**

- The minutes from the bi-annual meeting of the REAMIT consortium should be finalised by the end of February. This means that partners taking notes of the consortium meeting should send their parts to JG by 4<sup>th</sup> of February. This gives JG time to compile inputs from partners into one coherent document and send it to KP; KP to finalise the minutes and send it to RR for a final check. The final minutes with updated action log should be shared with REAMIT partners in the first week of March 2022.
- JG has already received the minutes from TD and has finished his own minutes. James will resend the recording link to Sahar so she can complete her minutes.
- SB (Sasha) is on holiday until 8th Feb so there may be a delay in receiving hers.
- KP confirmed that in January 2022, REAMIT officer at the funder, sent several emails to KP and RR, requesting clarifications from the Lead Partner about the REAMIT extension budget.
- RR, KP and YD have been working on addressing these questions in the past 3 weeks.
- KP confirmed that Whysor's auditor has experienced problems with certification of Whysor's special report 3.3, which has delayed certification of the REAMIT project progress report 3.3. KP has been working with the funder on addressing challenges faced by Whysor's auditor.
- KP confirmed that partners should be soon completing their reports 3.2 in eMS, including certifications by their auditors. KP asked partners to make sure their progress reports are submitted to the LP without delays.
- KP asked JE whether she had received a laptop from SA. JE confirmed that she had received SA's laptop and worked on it at home.
- KP asked JE to send her an email reminding to start the work on the new Visiting Lecture contract.

**Action KP:** confirmed that RR and YD would discuss with SA purchasing a new laptop at the meeting at the end of February 2022.

**The next meeting: 16 February 2022, at 1:00 pm.**





## REAMIT sub-group meeting, 16/02/2022

Attended by Katarzyna Pelc, Gautam Samriya, James Gillespie, Tamiris da Costa, Xavier Cama, Sasha Bennett, Sahar Ahmadzadeh and Joy Eze.

### WPT1

- Human Milk Foundation: Kate is arranging with Imke the transportation of loggers for the extended pilot.
- The sensor's supplier could not send the invoice to purchase new equipment suggested by Imke for HMF. The finance at BED do not want to proceed with this transaction if they do not have an invoice. For this reason, Kate will try to find another supplier of sensors. 15 sensors will be shipped to Whysor for the pilot test with BioGros, and twelve will be sent to BED for HMF.
- Kate contacted the supplier of loggers in South Africa, but there was no response. Imke sent an email requesting that the supplier split the invoices between Ulster and Bedfordshire.
- Kate is attempting to schedule a visit to HMF. She suggested that Tamiris' visit to Yumchop and BED may include a stop at HMF to motivate Natalie to get more actively involved in the LCA exercise.
- The sensors will be purchased in the next two weeks and delivered in three weeks. Sahar will mount everything. James offered help to install the binary sensor. So, Kate will arrange a trip for Sahar, Tamiris and James. Sasha is also keen to take some videos and photos at HMF.
- Levstone proposed a blue maestro sensor as a new solution for HMF. Tahmina suggested that before going and installing the blue maestro sensors at HMF, it would be helpful to do some trials by the internal colleagues at Bedfordshire. Currently, BED is testing Blue Maestro Sensors before its application at HMF, as suggested by Ram.
- Sahar, Kate and Tahmina have volunteered to test the blue maestro sensors. On 15<sup>th</sup> Feb, Kate, Sahar and Davender met physically in Bedfordshire. He brought the sensors and the Android phone for Sarah, and he helped install the LEVstone app on all the phones. In the next week, Tahmina, Sahar and Kate will try to get familiarized with the LEVstone app and test how the sensors work at their home, when they go shopping, when they put the sensor in the freezer, etc. and everything should be recorded on the mobile phone on the app. The sensors produce data on humidity and temperature.
- After one week, they will have another meeting to explore other app functionalities. Davender's company developed the app, and four people worked on it. Another different app developed by Levstone for DPD (a large transportation company) can be adapted to REAMIT. BED is currently testing this app before proposing this system as an alternative to HMF.
- Kate has taken some pictures and is preparing some notes from her meeting with Davender. According to Kate, it is a difficult app, and she did not understand how some functionalities work. Tahmina suggested doing a similar test using the sensors from Whysor, before installing them at HMF milk bags.
- James thinks the app is grossly complex, and it contains lots of features that are not necessary for REAMIT, e.g. messaging functionality. James suggests cleaning up the app for remit purposes and simplifying it.
- Ram has requested that the app avoid getting the data uploaded to the Whysor cloud instead of to the BED server, and Davender said it would not be straightforward.
- According to James, it is not possible to do real-time analysis on the cloud from BED to Whysor standpoint using the app. To incorporate functionality like that would be a significant undertaking.

- Kate will check with the app provider if the data can be transferred to both - Whysor cloud and the Big Data server.

The app can be downloaded at the Google Play store on the Android phone - Transport tracker – IoT sensors (Levstone).  
[https://play.google.com/store/apps/details?id=com.levstone.mobility.trustedtransport&hl=en\\_IE&gl=US](https://play.google.com/store/apps/details?id=com.levstone.mobility.trustedtransport&hl=en_IE&gl=US)

#### BioGros

- Kate has experienced challenges with buying sensors for the pilot test with BioGros.
- James believes Ulster can help BED buy the sensors from the Dutch company. There is also a possibility of buying through the website, but BED's finance always requires an invoice before actioning the payment.
- Blue Skies: Sahar wrote the minutes from the last meeting with Blue Skies and shared them in SharePoint. She is planning a meeting with Kate to understand the next steps she must take in this pilot test.
- WD Meets: No updates since the last meeting. They were deep cleaning the dry ageing chambers, which can take at least a week. James will follow up with them by the end of this week to see if there is an opportunity for starting the trial in the next week or two.
- For Clostridium Bacteria, James Dooley sent the names of the strains of DNA to James to order it from a German supplier. However, as the company works with organic materials, there are shipping regulations, and it is not a straightforward process for ordering whatsoever. It is necessary to get a verified account, and if it is the first order, they request a letter headed paper from the university. These sorts of things might be an active strain of DNA rather than frozen DNA.
- The company took 2 days to verify James' online account, and now it is necessary to register with them by bias on paper authentication first. James emailed them back and asked if they needed the paper authentication from him or could proceed with the order.
- According to James, they are a small group of research scientists. He got an automated reply saying they would get back to him, but he still has not heard back from them about needing further proof that he belongs to an academic organisation. James needs to order three strains of about 150€ each, totaling €450.
- Musgrave: James had a problem with receiving the loggers due to Brexit. He got a post saying he owed a £137 import charge before being released. He paid the charges, but they have made a mistake there because there still should not be import charges when getting something from within the EU. So, after a couple of days, they released the parcel to James without charge. James got the additional 4 loggers from Whysor. He ordered those four sensors from Farnell.
- James has wired up two loggers, and they are both working. He took some videos, and Sasha can produce a documentary about sensor preparation and how to get sensors ready for installation at Musgrave, which takes about half an hour to do. James will try to document everything as he goes along. He is working with Marco in the background to get them properly configured.
- James is going on-site on Monday to talk with Musgrave to see the vans and examine where he will install the sensors. The sensors can be installed on Monday or other days, depending on how he will attach the sensors to the vans.
- James has also been testing using one of the sensors in the background at his home as a testbed for the binary sensor.
- Marco got the binary sensor working, but the data is being recorded simultaneously as the trip data, which means it is displaying on the dashboard. He must build a new component for the dashboard that will separate the bag status and the trip recordings at the minute as they are both coming in.
- James is planning to install 12 binary sensors together with the Whysor sensors. Each sensor costs around £10 each. As the supplier is from the UK, it should be quicker if BED purchase the sensors. Kare requested James to send 3 links because she needs to present the best offer, even under £200.

Kate will try to purchase the sensors. Otherwise, she will change the supplier and see if Imke can suggest one in the UK. James mentioned that Farnell is from the UK and is the biggest component supplier globally.

- Today (16/02), James met with Tahmina and RAM about 3D fluorescence fresh detect sensors. James asked for a meeting with Gypsy. Tahmina thinks you can have a meeting with Gypsy, but she would like to be involved as well.

However, they do not think James will get anything meaningful from this meeting. She believes it is better to meet with Gypsy, Tahmina, and Matthias.

- Tahmina said the sensor could change some parameters and she believes Matthias can help suggest something. Matthias was questioned if it is possible to change LED (Light Emitting Diode) tires, and he may say this is more extensive work and maybe this is outside of his capability. Ram thinks this is outside the scope and suggested looking for something else.
- Tahmina also says that another problem could be that the sensor cannot detect the type of bacteria. It may not detect groups of bacteria, big groups of bacteria. James has the green light to organise the meeting with Matthias, Gypsy, and Tahmina.
- Joan is trying to employ somebody to help James with these tasks, but she is struggling because she is advertising for staff for other projects.
- According to James, Imke has the idea to use fresh decide potentially to detect bacterial count on preparation at the commercial kitchen of Biogros. Matthias provided two resources related to this analysis. One from a PhD thesis at the University of Copenhagen used fresh detect for detecting total bacterial count and total viable count on a conveyor belt of a food preparation company. Moreover, the University of Bonn presentation essentially uses the same device and circumstance, a commercial kitchen with steel countertops. However, unfortunately, due to the fresh detects essentially going bust, that research did not continue further. James will meet with Matthias to see how this idea of surfaces works, and he is still waiting to hear back from Imke.
- There is no update from Glen Affrick, Sasha has been sending emails to them since they had the meeting with Jumo, the sensor providers, to confirm their sensor requirements, but she still has not heard from them yet.
- Gautam had been communicating with the Food Cloud co-founder. She has yet to respond to his suggestion of a visit to their site in Cork, but she has yet to finalise the details about the suitable date.
- Xavier is not getting positive responses. He talked to a company, but it did not suit and stopped because he was not getting responses.
- **Actions status:**
  - **Joy to send an email to Andrew relating to the invoices: Complete.**
  - **Kate to understand DB's plan for using Blue Maestro sensors at HMF: ongoing**
  - **Kate to arrange a meeting with Gipsy about the 3D fluorescence pilot test: Kate will wait for James if he is still keen to have this meeting.**

## WPT2

- Related to the data transfer from Whysor cloud to the BED server, Joy, James, and Gautam wrote the script in two long sessions. Sahar was also involved in that session. The BED server updates automatically when the data comes from the Whysor cloud.
- Sahar sent a doodle poll to analytic partners for the availability regarding the Yumchop data analysis. She would like to ask the analytic partners if they have any updates regarding the data analysis. James and Gautam sent emails to help Sahar improve some of the graphs in the previous WPT2 meeting.
- User manual: Sahar has written some chapters, and some are already finished. She sent it to Joy for some feedback, and then she will share it with other partners.
- For the next WPT2 meeting, Sahar will send a doodle pool to all analytic partners and everyone engaged in WPT2.
- Related to the license, Sahar sent emails to all analytic partners asking if they could connect to the server to understand the active members. Currently, the number of active members is less than 50 people. She believes the servers can still handle this number of people, working very well. So, she is not planning to purchase another license.

- According to Joy, some of the partners have been losing access to the database because of how BED used to update the data from Whysor database, but now with the help of James and Gautam, they can access it. The data is coming in weekly. Joy tested the codes, and they are working very well.
- Joy is concerned if Sahar would be able to analyse the data because there is a large amount of data coming to the server, she checked it today, and there were about 51 timings. So, she does not know if they will pick one sensor in different places or if it is possible to reduce the recordings to maybe five times.
- Actions status:
  - Joy to follow up with Tom to see if he can push data automatically: Complete
  - Sahar to do some updates for the data coming from Whysor to the shared instances: Complete
  - Joy and Sahar to address the problem of not automatically updating the shared instances: Completed and solved.
  - Joy raised an issue for transferring data from one server to another: solved.
  - Tom to share the script with Joy and Sahar: ongoing.
  - Joy to chase up Tom to see if he is pushing data from Whysor cloud to Big Data server manually or automatically: Complete
  - Joy to check how to update from one table to another in another server: Complete
  - The line error that needed some further investigation: solved
  - Expertise needed. Gautam can help Joy, but he needs admin access: done.
  - Meeting with Joy, James, Gautam and Sahar: done.
  - Joy to coordinate with other partners to update the table into another table in another server: ongoing. Everyone now has access to the updated data because data can be updated automatically to the shared instances.
  - Joy to set up a meeting to coordinate to solve the issue with the help of other partners: done.
  - Sahar provided updates related to writing up a user manual: Complete Sahar to download word files related to users' access to the server: Complete
  - Sahar explained the issues she had to have remote access to the server: solved.
  - Sahar to send the draft version of the user manual to Yan, Ram, WPT2 members next week (Big data hub user manual): ongoing, because she just sent it to Joy.
  - Sahar to send the table of content and the introduction to the User Manual to Joy: done
  - Sahar to work on the user manual in the next two weeks: she finished four chapters, so it is almost finished. Only a few chapters left. Ongoing
  - Sahar to organise a meeting with Data analytics partners related to Yumchop data analysis: the doodle pool was sent.
  - Sahar to organise a meeting with analytics for Yumchop data analysis: is not done because they first have to organise a meeting with data analytics partners related to Yumchop data analysis.
  - Sahar to send the doodle pool after 7th Feb: done.
  - Sahar to contact Kate and Ram asking for support in the purchase of license: Sahar already sent those emails.
  - Sahar to send the minutes for the meeting on 14th and 17th HMF: The minutes are already in SharePoint.
  - Sahar to set up a meeting with UESSEX, and BED about the discussion about licensing order: done.
  - Sahar to write up a list of people who need access to the server: done.

- Sahar to contact Ram, Yan and Kate asking for support with progressing the purchase of the license for data analytics: done
- According to James, contacting Tom on automatic syncing of data is still to be completed. Tom runs a script manually to sync the Whysor cloud with the Big Data server once a week. Tom needs to be contacted to see if he can automate the synchrony of the Whysor cloud with the Big Data server every day or instantly.
- Joy does not work with Whysor cloud, only the REAMIT database of the BED database. Joy sent an email to Tom, but he did not answer. Tom uploads data weekly, every Thursday night, but Joy does not know whether it is done automatically.
- From the last conversation between James and Tom, he said the data would be synchronised from the Whysor cloud to the Big Data server at BED.
- According to Gautam, whenever Tom updates the data once a week manually or automatically, there will be a delay of at least one week for any analysis that REAMIT can do. So, the analysis will not be in real-time. However, as soon as he pushes the data into the Whysor server, there will be no problem syncing the data from the Whysor server to the BED server.

#### **WP C**

- Sasha is working currently on the production of a newsletter for March. Sasha sent an email to partners to request updates or any suggestions for articles that can be included in this newsletter.
- Sasha is planning to include a general overview of the updates of all pilot tests. It would be good to include something on LCA and an article on the case studies, probably Yumchop and HMF.
- James, Usha, Sasha and Kate attended a meeting with Rich from Type40, a video production company based in Northern Ireland. They suggested developing a documentary about REAMIT. Sasha tried to plan a documentary for REAMIT a few times, as it is in the application form, but she has no concrete plans for when this will be filmed or the format and structure.
- Sasha discussed with Type40 how REAMIT could develop this documentary over the next coming months. The plan is to have this documentary completed by December 2022. Sasha is waiting for the quotation for the video production and how long it will take. Type40 will determine if they must travel to each pilot test company to film on location or have to film some of it ourselves. Sasha hopes to receive the quote by the end of this week or early next week. Sasha will also send a brief on what REAMIT is expecting for the video production to the company.
- The plans for the next month are to work on videos for the pilot test, starting with Yumchop because she believes this case study is the one closest to completion and then moving on to HMF. Sasha also intends to add more to the video from Picnic. She is in contact with Imke and Mark from Picnic.
- Recently Sasha published infographics on the website. The infographics have been published in English, German and French with the help of Imke, Andrew from Valorial and Gladys.
- Kate asked Sasha to send an email with her proposed themes for the newsletter and include an article about Sahar's presentation in IRAC (Institute for Research in Applicable Computing).
- There are still some actions regarding the REAMIT website, such as changing, updating both websites and improving the websites. According to Kate, the logo sometimes seems very small, sometimes very big.
- Kate suggested a more extended session on the communication WP at the next meeting, particularly on the website, to see how it can be improved.
- James noticed Ram's email address is still his BED email address. Sasha will email Ram to confirm if the University of Essex can be included in the REAMIT website as a sub-partner of BED. .

- Kate noticed that when the different videos are played, the text is cut, and it is possible to see part of the text freely. Sasha will try to rearrange its size.
- **Action for everybody: to look into the REAMIT website and see how we can improve it.**
- **Action for Sasha: to think about how we can better use the REAMIT website.**
- Gautam noticed that in some places on the website, there are many blank areas, spaces that are not utilised. We should also utilise that space somehow with some more material.
- The call for participation in technology demonstrations is dated 31st Dec 2021 on the website, and it should be updated for the end of June 2022.

**Action: Sasha to send an email to Ram to confirm the dates for the open challenge call.**

- Gautam plans to present the REAMIT project at the MTU event next month and contact Sasha for help.
- Sasha requested anyone with upcoming events, speaking remote or in person, to send details to include on the website and in the upcoming newsletters.
- Sasha's new idea to make the website more interactive is to show some data tracking on the website to reflect what we are doing at REAMIT and to give more real-time data, e.g. the way how Whysor receives the data and shows it in a graph and maybe quantify how much food REAMIT is saving in general across all the pilot tests. Sasha would like to show a clock or a timeline on the website, continually changing throughout the day. Every two minutes or so, we would see further updates, and it will say today it was saved X tons of food or maybe showing it in a monetary value.
- From a technical standpoint, James thinks the Whysor dashboard cannot be exposed outside of the Whysor logging. James could write some script in Python to pull data from the BED server on the website. It is essential to verify if the companies would be willing to share their data publicly.

**WPT3**

- Regarding the review paper, Tamiris completed the LCA section and sent it to other partners involved, James and Xavier. They agreed to send the other sections by the end of February.
- Tamiris is planning to visit Yumchop, BED and HMF to collect the data in person for the LCA and the case studies. She will also try to help with the videos for the communication team and check the location of the sensors.
- Tahmina said probably it will not be possible to look at the Big Data Server because it is in a highly secured area at the university, so even BED partners cannot go there. They just visited it once, and they do not want to let us there anymore.
- Joy offered to collect all the information about electricity, consumption, materials, etc. Sarah will take a video to visualise this server.
- Kate will keep Tamiris informed about the preferred timing for visiting Yumchop and HMF. It is expected that the sensors arrive in 2-3 weeks, which is an excellent opportunity to visit the companies. In addition, Yumchop has a traineeship program and BED is looking for a student. They advertised the program among the students at BED. So, ideally, the students would be in place at Yumchop during Tamiris's visit.
- The temperature sensor sent by James arrived. Dr Fionnuala is managing which lab in UCD can be used to weigh the components of the sensors.

**WP M**

- Kate is working on REAMIT project Progress Report 3.2. The special REAMIT progress report 3.3 is stuck at the moment with the BED auditor. No progress here. It looks like both project progress reports 3.3 and 3.2 would be audited at the same time by BED auditor in March 2022.
- BED has not heard from the funder regarding the 12-months REAMIT extension budget.
- James is waiting for Sasha and Gautam's minutes from the last Biannual Meeting of RAC/WP/RSC meeting. They agreed to send it by the end of the week. James will compile all minutes and send them to Kate next week.
- It was discussed how to facilitate minute writing for the future, as recordings with transcripts are available in Teams. Teams automatically generate transcripts.

Next meeting: Thursday, 3 March 2022, at 11 am.



## REAMIT sub-group meeting, 03/03/2022

Attended by Katarzyna Pelc, Gautam Samriya, James Gillespie, Tamiris da Costa, Xavier Cama, Sasha Bennett, Sahar Ahmadzadeh and Joy Eze.

### WP T1

#### HMF

- The purchase of sensors had been actioned. The binary sensors were still waiting for approval of the purchase order though – probably to be approved that same day or the following one.
- As soon as Kate knows the sensors are on the way, she will start preparing the trip to HMF. **ACTION: Kate to create a Doodle poll to see when Tamiris, and anybody who wants to participate, could make it and then the dates will be proposed to Natalie.**
- Bluemaestro sensor proposed by Levstone (Davinder) for HMF: Sahar, Tahmina and Kate had been testing them. It looked like the system was quite complex and understanding the app was not trivial. The REAMIT team would need to write a manual about the basic functionalities. However, Davinder was not very keen on writing a manual. They then asked Davinder if the application in the app could be simplified but Davinder did not seem keen on it either.
- Ram had expressed to Kate he did not think the REAMIT team should keep working with this system in its current format: Tahmina and Sahar will keep on testing the system but it will not be likely proposed to HMF. Though maybe Davinder agrees to some changes in the future.
- KP had received 12 loggers from Whysor and was going to deliver them to Sahar.
- James asked if the **Infranol** (temperature) probes had also arrived. Kate explained this was still being processed at BED as Kate has just received procurement permissions.

#### Yumchop

- Kate had no news from Abi regarding the studentship. Ram wanted to combine Tamiris' visit with the student placement. **ACTION: Kate to contact Abi about it.**

#### Blue Skies

- Sahar, Kate and Ram had a meeting with them, the minutes of which were uploaded in Sharepoint. Sahar was expecting to get some videos/material from them but had not received them yet.

#### WD Meats Clostridium Bacteria

- James: Mark had phoned James, and James was due to go up on site the following week to check and restart the data collection from sensors in the dry-ageing chamber.
- James spoke with James Dooley, who was going to order DNA samples from another supplier. There were some forms that established a fine for not storing DNA samples correctly – hence assistance from James Dooley was requested and who was going to take care of purchasing them.
- **ACTION: James to meet with James Dooley on the following Monday with him, to find out if samples have been ordered.**

#### Musgrave

- James had gone on site the previous Monday to see the setup, their vans, to discuss threshold temperatures, and collect phone numbers and emails for those who need a login to the REAMIT

dashboard and get alerts. Musgrave asked him if it was possible to monitor two zones at the same time. They would like to monitor a frozen area and a chill area in their vans - as they deliver both fresh and frozen products. That would mean two different temperature read outs and having to add more sensors. James met with Marco at Whysor to see if it was possible to have one Eagle logger and two different probes.

- As a result, that same morning, James had already received 5 additional sensors, hoping that it would enable getting readings on both zones. He will be installing them in one or two weekends. Note: James bought them personally and needs to claim them back.

#### Glen Affric

- Sasha reported that the latest emails, or communication with regard to this pilot test, was shortly after the previous WPT1 meeting when Imke asked NTU about the reason she did not hear from the sensor supplier (Jumo). Following this communication, Imke then sent an email to Trevor at Glenn Affric (on 21 February) to see if they needed help to push the pilot test forward.
- Sasha explained that, actually, there had been no response from Glen Affric in a long time. A successful meeting with them and Liverpool University had taken place some time ago, but there had not been any communication from them ever since. Usha followed up on Friday, 25 February with Adrian and Tom from Liverpool University to see if they had any news, to which they said that they were going to contact Glenn Affric directly.
- In conclusion, NTU was trying to get in contact with Glen Affric but there had not been a response so far.

#### Burns Farm Meats

- Xavier reported that the UCD team had recruited a company in Ireland: Burns Farm Meats, an abattoir in the north-west of Ireland with their own farm as well. This company has cold rooms in which they store meat for the maturation process, and they are very interested in having tools to monitor these rooms. They know they have a loss and they are very interested in temperature sensors as they use the cold units for many things (not necessarily keeping only one particular set of meat at a time until the maturation process ends) and thus the door may be open for too long and they want to find out. In the 2 already conducted meetings with the company, it was concluded that the pilot test would encompass temperature and humidity sensors with a possibility of incorporating cameras as well.
- The next step is a visit to their facilities. Ram suggested the visit could include someone from Whysor as well, a wider team. Imke was on leave and Xavier was going to wait for a response from Whysor about this visit. James had already confirmed he would be also visiting the site.
- Kate asked Xavier to look at the power point template for presentation of pilot tests (in the shared drive). **ACTION: Xavier to use this template to start describing this new pilot test at the WP T1 meetings.**
- Gautam (MTU) had been trying to contact other companies in Ireland to explore possible pilot tests. Gautam had not heard from Food Cloud. They had sent some documents and videos about their facilities/operations so that Gautam could study their processes. After that though, there had not been any other response. He had been sending emails to Food Cloud but no reply had been received yet.

#### 3D Fluorescence pilot test

- KP confirmed that a meeting between James and Jipsy was still possible if James wanted to.

- James explained the latest news regarding 3D fluorescence: Trevor Cadden told James about a poultry producer that could be a possible candidate for a fluorescence pilot. In conclusion, UU has a lead for this pilot test that James intends to explore in the future.
- Since REAMIT had been extended formally, KP asked if Joan (UU) was still planning to recruit a fluorescence expert. **ACTION: James to ask her about it in the near future in the next UU subgroup meetings.** Some (preliminary) talks in the past had taken place with Joan regarding the recruitment of a spectroscopy expert James knew of, but that person was already involved in another project so Joan was not sure if they could hire him/her.

## WP T2

- Sahar explained that the Doodle poll she created, to organize the next WPT2 meeting, was not working. There seemed to be a temporary difficulty and she could not see the partners' responses. James and Kate confirmed that the Doodle poll seemed down for everybody, which was a general issue, and advised Sahar to wait a couple of days and check Doodle poll again.
- Given Rams emails asking for a date for the WPT2 meeting, **ACTION: Sahar to wait a day or two and if doodle poll was still not working, to find another way to ask partners about their availability for WP T2 meeting in March.**
- Sahar asked Kate about the minutes of the previous WP T2 meeting. She was confused as Ram had updated a document with a wrong date, and she did not know whether to use Ram's documents or to create a new one altogether. Kate suggested that Sahar used Ram's version but she needed to make sure the discussion section had been updated (as well as list of attendees, among others), and reflected the real discussion at the meeting. Kat suggested **ACTION: Sahar to have a quick meeting with Ram to find out how to finalise the minutes – sine Ram offered to meet with Sahar online about this matter.**
- As for the maintenance of the server, there had been a meeting with Joy, Gautam, James and Sahar: they had been working to solve the server's issue. Sahar asked Joy if she could provide details on this later.
- Regarding the user manual, Sahar explained that she had finished some parts, Chapter 2 and Chapter 3, and she had received feedback from Joy. Sahar to consider feedback and sent it on to the wider group (or Kate/Ram).
- As to the data analysis part, Sahar had not added or made any changes but she had requested help from James regarding some graphs – they would be meeting that same day.

## Server status

- Joy explained that although, overall, the server was working well, there had been a chain of emails with Whysor as they were not able to transfer data into the BED server – seemingly Whysor had read but not write permissions.
- Joy explained the series of troubleshooting an action she had performed, for instance taking the script and executing the code from her end. In her opinion, there was a restriction limitation. She was looking at ways of addressing this.
- When checking out this restriction problem, Joy discovered that the shared instance was not running, which happens from time to time, she observed. Joy had to get it troubleshooted. She was not able to connect to the shared instance outside the server – a REAMIT connection issue. She was able to

connect to it at the end, and asked Whysor if they could try from their end as well, but they had not confirmed it yet.

- Joy added that when using admin credentials everything seemed to work correctly. When Sahar tested non-admin credentials, they saw a problem which they had already seen before, not able to connect from other remote computers besides the work pcs, as if there was a new layer of restriction. Joy had been in contact with the technical department/ICT admins at University on this but no response obtained.
- There was going to be a meeting possibly the next day or early next week with Whysor to see if they can connect correctly and transfer data.
- Kate asked about current state of data from different pilot tests. Joy said the only pilot test not sending data was WD Meats.
- Kate asked on data transfer between Whysor and BED servers: at the moment, data from the Whysor cloud is pushed manually to the BED server, Joy clarified.
- That same week or on the following one, Joy was going to meet with Gautam, Sahar, and James to see how to work on this restriction/layer of protection. Joy pointed out that they were not working on the automatization of Whysor-BED data push, but rather making sure Whysor could send data in either way – manually or automatically.
- Adding to the discussion, James observed that the problem the REAMIT team was facing at the time, should be perfectly solvable, and as it was, there was no need to involve anyone else at that stage. Essentially, he added, Whysor did not have write permissions, but granting the correct permission should not be too complicated.
- James had prepared a high-level spreadsheet which reviewed each of the pilots - there was missing data from Glen Affric and nothing on Blue Skies though. He tried to map out each trial, what was the sensor data that REAMIT currently has and what the end goal of each pilot is.
- He explained that REAMIT may need to establish the collection of other types of data not being collected at this stage. For WD Meats for example, James needs that, after the dry-ageing process, Mark sends him the amount of trim loss of each beef.
- James had prepared the spreadsheet and had sent it to the data analytics team in Ulster to get more ideas, feedback and machine learning possibilities from them. James explained that the reason behind preparing this document was that, as it was, the REAMIT analysis was going to be restricted to time series analysis, therefore, to explore the possibility of expanding and growing in the data analytics aspect.
- Kate reminded the group of a previous work made by Gautam also pointing into a similar direction. Kate suggested to combine both works and expand upon them.
- **ACTION: Sahar to include the following items in the agenda of the next meeting of WP T2:**
  1. Table prepared by James
  2. Gautam's document.
  3. System requirement specifications document by James.
- **ACTION. Gautam to send the latest document to Sahar copying Kate, James, Xavier and whoever interested in data analytics.**
- **ACTION. Sahar to, once she has received all the documents, send the WPT2 agenda, while also attaching these documents to allow time for people to review them.**

- **ACTION: Sahar to make sure these documents are saved in the SharePoint in the folder dedicated to WP T2.**

### WP T3

- Tamiris explained that they had solved the problem with the database for LCA.
- Tamiris had successfully installed the open LCA software on her computer and she had also been able to weight out the components of the sensors. She had some preliminary results as to the impact related to the sensors. **ACTION. Tamiris to present the results at the next sub-group meeting.**
- Kate asked for updates on the Yumchop LCA studies. Tamiris explained that there were no updates, that she had not heard from Abi since January or so and that she was still waiting to be able to confirm the dates of the visit at Yumchop.
- James confirmed that there was no date yet for the next WPT3 meeting. It could be in a month time, nearly the end of this month or start of April.
- James said that Yan had prepared a questionnaire and sent it to Ram, James and Kate. James was not sure whether to send it to Trevor and Elaine yet or wait until deemed okay by Ram and the small group first.
- James explained that as for the qualitative questionnaire, they were trying to get Elaine involved in that. There had been talks as well on getting the questionnaire in a case study.
- James had talked to Usha and proposed a combined case study for an abattoir Burns Meats and WD meats – Usha liked the idea. WD meats is really hard to get their name attached to anything, and given the size of Burn Farm meats maybe the REAMIT team is in a better position to make a difference.
- Also, as for other case studies, Usha was trying to channel her case studies questions via Tamiris. But there were concerns on how much workload/questions can be channelled through her.
- Another aspect James talked about was regarding the qualitative and quantitative questionnaires. Maybe combining both of them together would be a better approach, he said. Perhaps a combined Yan's and Elaine's efforts rather than Yan's and Usha's. Some organisation/planning was needed on this.
- **ACTION: Kate to discuss with Ram how to facilitate the work on case studies and the work done by Usha and Ulster as no clear actions had been previously defined in WPT3 meetings.**

### WP Communication

#### Website

*Sasha shared her screen so that all the team could go through it and make suggestions.*

- Sasha had taken some suggestion and considerations from the previous meeting. Sasha mentioned she would be making those but still confirmation from Ram was needed.
- Sasha explained that there were going to be new features added: regarding the call for participation – the document currently available on the website - Sasha wanted to create a digital form so that companies/people could express interest and that would go directly to the REAMIT gmail – Sasha observed there was not much a way to contact REAMIT.

Remark on recruitment of pilot test companies: The REAMIT team is still accepting new companies, though it is not a priority anymore to recruit new ones for most pilot test partners.

- Front page: Kate provided the following suggestions and change needs:
  - o The project dates on the website were in need of correction.
  - o The REAMIT logo on the left needed to be bigger, filling the space. Sasha observed that it was not possible to increase the size without pushing the buttons. Some proposed options were then to remove the subscription button or to move social media buttons underneath subscribe.
  - o The text about the project needed correction, to include University of Essex (which had been confirmed). The lead partner would remain the same, just to change the email address – **ACTION: Sasha to ask Ram about including this UEssex email address.**
  - o To change the budget value as it had been extended.
- **ACTION: It was needed to discuss with Ram how to include his name or Yan's on the website.**
- Sasha proposed to have more images but higher up on the page so that people could see them first. For example, Kate recommended including images/screenshots from past steering committee online events.
- Sasha wanted to link the “find out how you can get involved” button to the new form that was being developed.
- Sasha mentioned it was needed to update the big data hub info – to develop a page on that, a general overview on what the data hub is all about.
- Sasha also wanted to link the data server to the website, creating an online access on the side. Joy pointed out that there may be restrictions to access the server from the website. Sasha concluded that if it was not possible, it would be left as it was. Also, manuals on how to access the server would not be published on the website as it would go on the public domain.
- Sasha wanted to improve the section on the top – to her, there was too much black so maybe changing some top text to the REAMIT dark blue. Similarly, to change the size of the text. In conclusion, visual changes were needed.
- Also, maybe there were too many tabs on the top. But it had to reflect the tabs that existed. Joy suggested having the tabs on the side instead. Sasha would have a look to see if that, or what other options were possible. James suggested reducing the number of tabs by combining some of them, so that when one hovers over them, the subcategories available appear (thus reducing the number of “main categories” or tabs).
- Sasha may need to contact the website building helpdesk for assistance on how to implement some of the suggested changes.
- Events page: This page listed REAMIT events. Sasha managed to resize the logos as it had been seen that they appeared stretched as one scrolled down. Logos could now be seen a lot better.
- Kate mentioned a presentation by Sahar that contained REAMIT updates - the request was for Sahar to summarise it so that it could be included in the website or in the newsletter. It was an IRAC meeting presentation made by Sahar. **ACTION: Sahar to send a summary of it to Sasha; and Sasha to include this information on the REAMIT website.** Ram suggested a simplified version because there was a lot of jargon in it. That could be included as a separate news article in the website as well as in the next newsletter.

- Partners page: This page was a brief summary of the type of organisations in the REAMIT partnership and their contact details. Sub-partners are not listed there.
- Funding opportunities: Sasha had updated it with new funding opportunities. Access to Whysor dashboard from there was possible.
- Overview page: a page about REAMIT and access to the brochure and related materials.
- Sasha pointed out that changes on the website were a matter of making it more appealing rather than the content itself. Some articles in the newsletter could be expanded on and included in the news section so that there are more regular news.
- Also, maybe having a feed of some of the recent articles on the home page as well for people to have a quick preview, she suggested.
- The way to increase traffic is, to Sasha, by updating with recent news, events, social media, etc., and maybe including a Twitter feed on the left hand side so that the website looks cared for, current.
- **Action: Sasha to keep doing these updates on the website on regular basis.**
- Kate asked if the part on the Big data hub could be populated and if previous articles by Gautam and some work from Sahar could be used for this. **Action: Sasha to liaise with Sahar, Joy and Gautam to develop content for this part of the website.**

#### Other (not website related) updates from Sasha:

- In the previous meeting, Sasha had talked about the videos they were creating, one of them with Picnic. Sasha had contacted Imke recently regarding this, but she had not heard back. Sasha then contacted Picnic directly with no response.
- Back in December 2021, Picnic mentioned that they had no time for it. At the time, Imke sent some images of Picnic but Sasha thought that would not be enough (opposed to actual footage/video). Unfortunately, there had not been much of a response as to getting this video made. Usha suggested going ahead improving an animated video as an alternative, and then getting approval from Picnic with just this animation. This was in order to complete the task even if not the original plan.
- Sasha mentioned that for the time being NTU will wait though, and keep requesting a full video/s.
- As for video recording at Picnic, NTU had received a quote from a company that Ulster had recommended, but NTU needed to get some more quotes in order to get a procurement.
- Sasha was still awaiting content from people to confirm the next newsletter. Sasha was going to contact people individually for it, and hopefully the content would be published on the third week of March. **Kate suggested an ACTION for Sasha: to send out an email to sub-group members outlining the proposed themes for March REAMIT newsletter articles. Sub-group members would then see whether they can distribute the workload among sub-group to help develop some of these articles.**
- In the next sub-group meeting, the team will take another look at the website to check out the progress and keep on improving it.

#### WP management

- REAMIT officer at JS confirmed that the REAMIT project had been extended by 12 months. Kate encouraged discussing the extension of contracts with each person's respective manager.



- Kate was working on preparing for audit of the REAMIT project progress report 3.2. But Bedfordshire was understaffed, thus Kate had to be helping out and involved in calculating staff costs and similar which was not straightforward.
- There were no news about REAMIT project special progress report 3.3, which concerned UCD, Whysor and NTU, and it was still sitting on the BED FLC auditor's desk. He was likely going to be auditing it together with the report 3.2 in the following weeks.
- Kate would do changes in the REAMIT AF in eMS system, e.g. in the application form and the extension budget as well as inclusion of UEssex as sub-partner of BED.
- Kate updated REAMIT Project Handbook and Risk Log and uploaded them in Share Point.

**WP long term**

- No updates reported.

**Date of next meeting: 24 March 2022, at 11 am.**



## REAMIT sub-group meeting, 24/03/2022

Attended by Katarzyna Pelc, Gautam Samriya, James Gillespie, Tamiris da Costa, Xavier Cama, Sasha Bennett, Sahar Ahmadzadeh and Joy Eze.

### WP T1

#### Burns Farm Meats

- Xavier, James and Gautam visited Burns Farm Meats on 23 March 2022. Xavier showed pictures of the site taken during the visit. Xavier updated about the visit and various locations/rooms on the site. The site has preparation room, freezing rooms, freezer unit where they store beef and other kinds of meats.
- There are issues regarding sealing of doors of the freezing rooms. Mould growth on the meat is a key concern that Burns Farm Meats have expressed and which they wish to address. Xavier also showed the pictures of refrigeration system and other areas on the site. Xavier updated that for the freezing unit, based on the visit, six sensors would need to be installed and for smaller freezing units 4 sensors would need to be installed.
- It was a nice visit and the company seemed happy to collaborate with REAMIT team and seemed positive about using information about this pilot test in REAMIT newsletters and signing of the NDA.
- Next step is to discuss with Whysor type of sensors needed for this pilot test and sensor installation.
- Xavier confirmed that meat storage in Burns Farm Meats lasts 21 days on average.
- Kate asked if they quantify volume of waste due to mould. Xavier said that we asked them, but they had not measured it so far. Kate asked if this is the same problem as faced by WD Meats. James said that it is a classical problem due to humidity levels. It is similar to WD Meats. Difference between WD Meats and BFM is WD Meat is very big, they fill the freezing unit once and it is closed for 21 days whereas Burns Farm Meats open and close the doors 4 or 5 times a day. WD Meats slaughters 300 cows a day while Burn Farm Meats slaughters 1 cow every one or two days.
- Kate asked Xavier if UCD has budget for sensor purchase. Xavier replied yes and they were also discussing it with Ram.
- Xavier updated that he would try his best to purchase sensors and have them delivered to site asap.
- Sasha asked if she could use pictures in future newsletter or communication materials. Xavier said it does not seem to be an issue. He can check with them for specific pictures.
- James added that they seemed happy about using the company's name in REAMIT communication actions.

#### HMF

- Kate confirmed that Natalie responded positively regarding REAMIT team visit at HMF. Based on REAMIT group's preferences, the dates preferred are: 12 April, 11 April, and 22 April.
- The visit would start at 10 am. HMF is located near Luton.
- Kate updated that Tahmina has asked if she can keep some of the sensors purchased for HMF for her analysis and experiments. Kate mentions that it is crucial that the number of sensors desired by HMF are installed at their site, so we would look into Tahmina's question after we have wired the sensors.
- Sahar also updated she needs some support from James for sensor configuration. James and Sahar will meet separately and configure it. Kate updated that we need the sensors ready before the trip.

- **Action for Sahar and James: Wire sensors, do the configuration.**

#### Yumchop

- There has been no reply from Yumchop to Ram's email on Yumchop case study and poster.
- Kate asked Tamiris if she would start approaching Yumchop for a visit around 12<sup>th</sup> of April. Tamiris would wait until we hear confirmation from Natalie on HMF visit on 12th April.
- Ram and James also would visit Yumchop.

#### Blue Maestro sensor for HMF

- Kate, Ram, Yan, Sahar and Tahmina had a meeting and decided not to use the Blue Maestro sensors and system proposed by Levstone unless the app is simplified as per REAMIT needs. Ram communicated this to Devinder. There has been no further communication on this from Davinder.

#### WD Meats Clostridium Bacteria

- James received details from Tom on how to fix the gateway issues for data to get transferred to Whysor cloud. He has not got a chance to test if those details worked correctly.
- James contacted Marco last Tuesday but could not contact him anytime later. He will contact him shortly again.
- James: DNA should be arriving from the supplier and it should have already arrived, but James has not heard further on this in recent weeks.
- **Action: James to test details sent by Tom.**
- **Action: James to contact Marco tomorrow.**

#### Musgrave

- James is working with Marco to enable second thermometer probe.
- Marco is on leave this week but he got configuration file for the sensor to get two temperature probe working in two sections of vans. James is waiting for Marco to come back from leave and configure the settings then James intends to go install the two probes.
- As another plan, James also discussed that he would install one probe initially and then Marco could do the configuration changes at his side meanwhile, and then James can install the other probe as well. James is currently waiting for Marco to come back from leave.

#### Glen Affric

- Sasha approached a contact of Glen Affric but she got a reply that he has left the company. He was instructed by Glen Affric not to reply to Whysor and REAMIT emails. He apologized for lack of communication and unprofessionalism.
- Kate discussed this with Ram who advised that NTU approach Glen Affric again, and if there is no reply, approach them again in six months' time. If still there is no reply, NTU will close this pilot.

#### WP T2

- James prepared a high-level spreadsheet with a review of each of the pilots.
- Sahar will send email to Joy regarding User Manual.
- Purchasing license: Sahar discussed it with Ram. There is no need for purchasing a new license as number of users will not exceed 50.
- Joy created three new instances over last few weeks.

- Joy asked James if Ulster partners have tested the connections and logged in. James confirmed that they received the emails but not tested the log in and connection yet.
- Joy updated that shared instance is down and set the James password.
- James reset his password on his own and he is able to log in with his new password. Joy had some issues with her RDP but she will try to access the shared instance through university network.
- Gautam asked if the issue Joy faced with shared instance was for everyone or just for Joy. Joy updated that since it's the problem is with her connection, so the issue is only with her and should not be with others.
- Joy updated that Whysor is complaining about slower speed when trying to transfer data after creation of triggers and jobs.
- Gautam: This is not unexpected, but we can look into workaround for that options and we can have a separate meeting for resolving this.
- James: He is also researching into ways to optimize synchronisation speed.
- James had internal meeting with Ulster analytics team who are lecturers in data science at Ulster. He discussed with them ideas for data analytics. They reviewed the Google Form from HMF and suggested it is comprehensive. James mentioned that to Sahar, can use Weather API to get weather data, discussed with Tom.
- Gautam confirmed that the Google form from HMF was comprehensive, but some additional suggestions can be made. He would send his input by end of the day. **Action for Gautam: To send his suggestion on HMF Google forms by today.**

### WPT3

- Tamiris presented the PPT of LCA work. Tamiris explained about sensor inventory and the software used for LCA. They had solved the problem with the database for LCA. She explained the process the finding impact in terms of CO2 emission equivalent of the components of the sensor on the global warming. She explained that her simulations showed that to compensate for the CO2 emission caused by using 1 sensor unit, we would need to avoid a production of 40 Kg of chicken.
- James asked Tamiris regarding the results if the number of sensors were increased in the study. Tamiris mentioned this study can be expanded further with more sensors and on more food products such as rice, meat, etc. Sasha mentioned that she included some pictures from this PPT in the newsletter. Gautam asked Sahar to kindly share her presentation on the shared drive for references, which Tamiris agreed to.
- Kate suggested some corrections in the poster for LCA. **Action: Tamiris to include the suggestions for corrections in the poster sent by Kate.**
- Tamiris updated that she had sent question to James for WD Meats. She was also waiting for some data from Joy from the server.
- **Action: Joy to send the mentioned data from server to Tamiris today.**
- Kate suggested Tamiris to go through the pictures and videos of Big Data server hub for her study which Tamiris agreed to.
- **Action for Sahar and Joy: Send the video and pictures of Big Data hub to Tamiris.**

### WP Communication

- Sasha presented an overview of newsletter draft in the current form and confirmed the newsletter was almost ready. She is waiting for feedback from Imke about Biogros. Sasha is waiting for confirmation from Musgrave if they are happy to get their name mentioned by Musgrave. James will send an email to Musgrave for confirmation.
- Sasha is waiting for article from Gautam on MTU Industry Day. Gautam mentioned that due to time constraints, as he was travelling to Sligo for Burns Farm Meats visit, he couldn't get much time for writing the article, but he will complete it and share it asap. Kate acknowledged it was a short notice and asked Sasha by when Gautam can submit the article. Sasha mentioned she would be happy if Gautam could share it by midday tomorrow. Gautam agreed to share it by tomorrow.
- **Action for Gautam: To share the article for newsletter on MTU Industry Day REAMIT activity by midday tomorrow with Sasha and Kate.**
- Kate suggested having a section on the REAMIT website dedicated to LCA.

#### **Website Updates:**

- Sasha updated about the changes in the website design as per the suggestions by the sub-group team. She requested feedback and suggestions from all on few sections.
- Kate suggested populating the website with content on multiple activities currently going on in project such as LCA, Big Data Analytics, etc. She suggested devoting bigger part on website content population with such activities in the next meeting.
- Sasha updated she is currently developing a documentary on REAMIT and the plan is to film it over next 3-4 months and get a first version in July. It would involve visits to multiple pilot test partners and we will decide on which partners and which member would be included.
- Kate asked if a documentary video can be presented at RSC meeting in July. Sasha said that we could have a first version of the short video ready by then.

#### **WP Management**

- Kate met with Imke to discuss the plan for RSC meeting in Netherlands in July 2022, which would be a hybrid event. Visits to Biogros and Picnic will be arranged before or after RSC meeting.
- Kate updated that special report 3.3 has been processed by the JS. BED is waiting for money from JS. Once received, the funds will be transferred to UCD, NTU and Whysor.
- Due to lack of staff at Finance at BED, Kate was asked to prepare for audit of REAMIT progress report 3.2.
- Kate started revision of REAMIT AF in eMS. The revised REAMIT AF will be a formal evidence of project's extension.
- BED considers employing a new staff member (Visiting Lecturer) to support the implementation of REAMIT WP T2.

#### **WP Long Term**

- No updates reported.

**Date of next meeting: 7 April 2022, at 10 am.**

## REAMIT sub-group meeting, 07/04/2022

Attended by Katarzyna Pelc, Gautam Samriya, James Gillespie, Tamiris da Costa, Xavier Cama, Sasha Bennett, Sahar Ahmadzadeh

Apologises: Joy Eze

### WP T1

HMF: No response from Natalie regarding the email Kate sent re the visit. It is unlikely that the visit will take place before Easter as its too short notice. Kate asked others for input. James said that it is probably not enough notice given the original proposed date was 11 April and today is 7 April. James that the proposed date (22 April) probably suited Yumchop better, according to Tamiris. Kate said she will propose a few dates around 22<sup>nd</sup> or the week after, or the first week of May.

**Action: Kate to send a doodle poll to gather input from partners on their availability for the meeting with HMF / Yumchop. Sahar will be on leave the last 2 weeks of April and will return on 5 May.**

James came to UoB to help wire the sensors for HMF with Joy, Kate, Sahar, and Yan last week (30 March). The prepared sensors are under Sahar's desk.

A lot of things are happening with Yumchop. Some sensors are currently offline – Imke is investigating it.

At WD Meats, James was able to apply the gateway endpoint details provided by Tom and reconnect the sensors to the Whysor cloud. James visited WD Meats and installed the reconfigured gateway on 31 March; hence the second dry ageing trial has been launched as of 31<sup>st</sup> March. This is due to run until 20 April.

For the clostridium trial, James Dooley has reported that he has a master's student in place to perform lab experimentation in the coming weeks.

For Musgrave, James has worked with Marco and now added a 5v regulator to the logger setup. This has allowed for two temperature probes to be installed in the loggers letting Musgrave monitor both the chill and freeze zones in their van at the same time. James will complete the assembly of the other four loggers this week and will contact Musgrave informing them that the loggers are ready for installation.

Re. Blue Skies, Sahar received videos from Blue Skies and has shared them with the wider Whysor team. The WeTransfer link has expired and Imke was unable to access the videos. Kate has asked Sahar to upload the videos on the SharePoint under WPT1 so partners can view the content.

**Action: Sahar to upload Blue Skies videos to REAMIT SharePoint.**

For Burns Meats, Xavier has discussed with Shane Ward the acquisition of sensors and informed him that the plan is to get 10 T/RH sensors for 2 chill rooms and a gateway. Xavier told Shane that the webcam idea has been postponed for the time being - this decision was made after the visit to the farm. They do not have the

scope at present to leave the chill room closed for 3 weeks, thus visual inspection is always possible. Xavier sent an email to Whysor team asking for advice on gateway and sensors but is yet to receive a reply. James said he can send some recommendations to Xavier in the interim and see if Whysor like them.

**Action: James to send sensor recommendations to Xavier.**

#### **WP communication**

Sasha shared screen to discuss website updates. Sasha has updated the website to reduce the number of tabs on the website and turned them into dropdowns with various pages available. Sasha asked if the call for participation in technology demonstration page title under 'About us' was too long. James suggested that perhaps it could be shortened to call for participation as the full title would be displayed once you clicked the link. Kate said that it is a cosmetic thing and that 'Call for participation' suggests to her we are looking for partners to join the project not for pilot test companies. She thinks it is best to keep the full title in, so it is not misleading.

Because there are less tabs, Sasha has been able to increase the size of the logo. The logo when clicked takes you back to the homepage. Ram's email address has been updated to the Essex email. The funding information needs updated since the extension and budget have now been approved. Yan suggested the quick focus page featured links on the main page be reduced. Sasha said if there are other pages that we would like included she can update it. Sasha suggested that the company logos could be updated to a carousel which would be hyperlinked so you can click on each of them and be taken to the partner websites individually. James asked if the logos could be hyperlinked in their current form, he liked the way you could view all institutions at once at present and was concerned that if in a carousel people visiting the website may miss some of the partners involved (they might not wait for the full carousel to complete). Sasha said she could make an image board using Wix and implement this.

**Action: Sasha to check with Ram if Action Sense should be still included as a sub-partner on the project (since they seem inactive in the project), or if they should be removed from the eMS and REAMIT website – as Kate is updating the eMS and Sasha is updating the website in these days.**

Logo banner includes all sub-partners and partners but only partners are listed on the website, which may be confusing.

**Action: Sasha to check with Ram whether we should include all sub-partners on the REAMIT website under list of partners. How about UEssex which has now become sub-partner of BED? shall we add them to the logo and list of partners?**

**Action: Ram's email address on the official REAMIT Interreg website needs to be updated.**

Gautam suggested that subheading menu items should be differently coloured to make it more obvious that they're sub-categories. He suggested light blue. Sasha said that she is trying to stick to the Interreg colour

scheme – and light blue is not included. She said she will try using the ‘REAMIT green’ for submenu items and see how it looks.

**Action: Sasha to make the subheading items a different colour on the dropdown menus.**

Sasha has also added a ‘Contact us’ form for expression of interest which feeds directly to the REAMIT Gmail account.

Kate asked if there is much traffic on the Gmail account. Sasha said there usually isn’t anything; the last amount of traffic came through after the UCD symposium.

Sasha said that news and events are the most common pages on websites to be updated. She said she suspects there are more news and events happening than what’s being reported.

Some projects have large news items on their website and only give teasers of the articles in the newsletters with links to read the full story on the website.

**Action: Sasha to update the website with information about Sahar’s presentation, Gautam’s event, and Ram’s upcoming April event; as well as the REAMIT steering committee meeting in the Netherlands in July 2022.**

## **WP T2:**

Sahar said that the monthly update meeting for the WPT2 is occurring this afternoon. She has sent an email to Davinder about the licensing, and has also sent him an invoice.

Regarding the server, James and Gautam worked with Joy and Sahar to resolve synchronisation issues. These were solved, however there are still sync speed issues. James tried 3 solutions (using OpenSQL, removing merge statements, and creating a primary key). Unfortunately, each of these solutions did not yield a positive result and synchronisation is still taking ~2 seconds per row; Since synchronisation is happening on a weekly basis some datasets have 5000 rows to add. This means it is taking 2 hours or more for data transfer. There are documented solutions online to fix this by rewriting trigger statements. James provided one such solution in an email, reported to reduce time from 30 minutes to 8 seconds. The team are due to meet on Friday to attempt to implement this.

Regarding the user manual, Sahar has received some feedback from Joy. Sahar has created 3 sections of the manual. Sahar plans to show the manual in the WPT2 meeting today.

## **WP T3**



Tamiris received an email from Imke with specifications on the sensor setup at Yumchop for LCA work. Tamiris is collecting some information from the supplier website but she will probably need to weigh a gateway.

The LCA paper that Tamiris has been working on has been split into two separate works; one focused on the technical and business landscapes and the other focused on the LCA. Tamiris is working with James and Xavier on the first paper while the second paper is almost ready for submission; she hopes to have it submitted by the end of this month depending on how long it takes Fionnuala to review.

James has not set a date for the next WPT3 meeting but given it is Easter soon he suspects it will be in early May.

Regarding the paper, James said that he has the opportunity for a free publication in open access MDPI sensors thanks to Elaine Ramsey at Ulster. The deadline for submission is 22 May but the Editor did say that we could request more time if required; however, Tamiris has already provided a very nice introduction and methods for the paper so we may not need an extension. Joan has approved of this idea.

Elaine and Trevor met with Ram and Yan to discuss Yans quantitative questionnaire last week (31 March). Trevor is preparing two questionnaires for the next meeting; one adding to the MOAT model that Yan proposed and one using the gold standard UTAUT2 model. The group will then decide which they prefer, or they may use both surveys (with the UTAUT2 serving as a benchmark). Trevor has proposed using a survey company to gather responses from companies; Ram and Yan both agreed. Trevor has a reasonably priced company whom he has used before.

James is working on an Osterwalder canvas for the qualitative case study; Elaine proposed that this should be used to summarise each pilot company. It is accepted as the gold standard in the field for case study work. James is preparing the canvas for WD Meats as an example and will share with the group once complete so that other pilot leads can complete the canvas for each of their companies. The canvas' will be used for the Market Readiness Report.

## **WP Management**

The audit for special report 3.3 has been completed; this affects UCD, Whysor and NTU. The money was transferred from Beds two days ago so should be with the respective institutions shortly.

Kate is still working with the auditor on REAMIT progress report 3.2, providing explanation and documentation as requested. Kate hopes to have this completed by Easter.



University of Nantes have requested to move money across budget heads to staff as they wish to employ another member of staff for 12 months. This should be no problem, but we are waiting formal approval from the secretariat.

Dr Elias Eze shall be soon joining the REAMIT project team at BED on Visiting Contract. He is a specialist in data analytics and will be joining WPT2 data analysis team.

Regarding the REAMIT consortium meeting in July, Kate has been working with Imke to plan this as a hybrid (physical and online) event and have agreed on Eindhoven in the NL as the location. The plan is to have the meeting on 6 and 7 July (Wednesday and Thursday), and on Tuesday and/or Friday visit pilot test companies that Whysor are working with on the project; namely this shall be Picnic, based in Eindhoven, and BIOGROS, based in Luxemburg. Kate said some planning of travel will be required for the Luxemburg visit.

Kate is working on updates in REAMIT AF in eMS following formal confirmation for REAMIT 12-months and budget extension.

Date of next meeting: 6 May 2022 at 10 am.

## REAMIT sub-group meeting, 06/05/2022

Attended by Katarzyna Pelc, Gautam Samriya, James Gillespie, Xavier Cama, Sahar Ahmadzadeh, Joy Eze and Sasha Bennett

### **WPT1 Pilot Tests**

#### **Yumchop, UK**

- It is reported that one sensor is sending too many alerts. The wrong position might be the issue.
- A visit at Yumchop's factory has been set up on 25<sup>th</sup> of M.

#### **HMF, UK**

- Currently there is no update. No response from Natalie yet. RR already sent an email, but still there is no response.
- Sensors are ready and are under Sahar's desk.
- Whysor's dashboard shows some information.
- The configuration for binary sensors is still under progress by Marco.
- James will check the progress the next week.
- Marco is working on some components.
- If remote test needed Sahar can help.

**Action: Kate or Sahar to send an email that confirms arrangements for the visit to Yumchop.**

#### **Picnic, The NL**

- Imke reported that the pilot test was not going very well.

#### **Raman Spectroscopy, UoN**

- The experiment is still going on in the lab conditions only.

#### **WD Meats – Dry aging chamber**

The second iteration of the dry-ageing trial has now been completed at WD Meats. The trial ran for 3 weeks, finishing on 20th April. James will be treating this trial as the baseline experiment as the beta of the pilot had only been completed over a period of 14 days. James has the sensor data available for the 3 weeks, but is waiting to receive the start and finishing weights of the hindquarters from Marc at WD Meats. For the next trial, James will discuss with Marc parameters which could be altered and monitored to see if these affect the weight loss on the beef (for example, the temperature or humidity of the Chamber over the 3 week period could be adjusted.) James hopes to launch another iteration of the trial before the end of May with altered parameters.

#### **WD Meats – Clostridium Bacteria**

James G and James Dooley visited WD Meats on Tuesday to meet Marc and Victoria, the on-site lab scientist to discuss the clostridium pilot / problem at WD Meats. James D is still waiting on the clostridium DNA to arrive from Germany as is following up with the company. James has proposed he helps benchmark and validate the PCR machine that WD Meats have purchased to ensure their testing is accurate. He has also proposed a DNA sequencing study to examine the source of the clostridium as depending on the location the

animal will have its own 'signature'. This will help with the traceability of meat at WD Meats and may also help them with supplier selection in the future.

#### **Musgrave, UK**

James completed installing 3 eagle loggers at Musgrave on Saturday 23rd April. He has been monitoring these over the last few weeks and they are working well so far. James is yet to determine the alerting logic for these loggers, and proposes he will conduct some initial analysis before meeting with Musgrave to define this (looking at floor and ceiling values to determine thresholds). James has to revisit the site to install the remaining two loggers – this will be another Saturday as it's the day vans can be kept off the road. James will complete this in May. A second filming date is being decided at Musgrave between Rich, Type40 Creative, Trevor, Ulster Uni and Robert, Musgrave.

#### **Glen Affric, UK**

- Sasha reported that the Glen Affric pilot test is not going well and she did not hear from the company.
- Sasha provided an update: the owner is relocated. Also, one person that was contacted previously, has left the company.
- The role of owner is changed to his son, but he is not very promising.

**Biogross:** 15 sensors installed and 6 new sensors are being purchased by BED.

#### **Burns Meats Farm, IE**

- Xavier got positive response from Burns Meats Farm to purchase the sensors and gateway and install them at the company's sites.
- Xavier hopes to install the sensors by the end of May.
- A confirmation for Xavier's contract renewal is needed.
- Xavier will be on annual leave next week and afterward his contract will be ended up.
- Hopefully the sensors will be purchased.
- The sensors will be to Xavier's place and James will help.

**Action:** Kate will send an email to Fionnuala and ask for Tamiris and Xavier contracts situation.

**Action:** Xavier to purchase sensors.

#### **Recruiting new companies for pilot tests:**

#### **Blue Skies, UK**

- Imke already expressed some concerns and will also discuss it with Marcel.

- Maybe the problem is connectivity issue, the other concern is packaging.
- We are waiting for Imke's updates before taking a final decision on this case – whether REAMIT shall engage in it or not as it may be outside of REAMIT's capabilities.
- The concern is maybe the technology required to address the needs of Blue Skies is beyond available (sensor, gateway, internet connectivity) options in the market.
- There are several issues/challenges with this pilot test: the technology is probably not yet available in the market, collecting data on food temperature during flight, there may be internet connectivity issues while the plane is flying and in remote places in Africa which may prevent the system from recording data and sending data to cloud, regulatory issues preventing electronic devices being operated during flight mode for security issues.

**Action: Sahar send an email to Imke to follow up her email.**

#### **Other pilot related matters**

Sasha is working with NTU on hosting an event focused on reducing carbon emission and working on sustainability. NTU hope they will recruit a new pilot test company through this event.

**Action: Sasha to provide information about this event on the REAMIT website.**

#### **WPT2 – Big Data Hub**

- The server was disconnected and being off. Therefore, Andrew and ICT at BED were contacted for help.
- Shutdown button was pressed by mistake and it shut down the server.
- Joy wrongly selected shutdown against restart.
- Some speed optimization is already done.

**Action: Joy and Sahar contact ICT and Andrew and resolve the issue.**

**Action: Sahar to work with Joy to resolve ongoing port issue and connection to server (to resolve error she was facing for connecting to server).**

**Action: Sahar to finalise the minutes of WP T2 April meeting and share it with WP T2 partners and upload it in SharePoint.**

#### **Data analysis for HMF**

- Gautam and James developed a spreadsheet
- The usage of ice for keeping the bags cool is explained.
- Providing optimization for best usage of ice, routes, weather, and traffic conditions' effect on milk transfer is suggested to be taken into consideration as data requirements.
- The google form showed new rows that can be considered for better analysis.
- Also how far the travel can take place to save milk from getting wasted.
- HMF is interested in monitoring temperature of milk.

**Action: Gautam to be involved in computational analysis/modelling based on variable Temperature to optimize and to see how the milk should be transferred.**

**Action: Kate (with support from partners) to capture in a simple word document, the ideas of data analytics partners expressed at various meetings, to support presentation of these ideas Natalie at HMF and explaining in simple language what REAMIT can do for HMF.**

- Gautam suggested route optimization based on getting access to some input parameters from HMF.
- Gautam suggested investigation on how temperature can affect the longitude (length of staying) milk to remain in a good condition.
- Gautam suggested investigation on following points: how they can travel with that much amount of ice, how much ice they can optimize, and how the process is failing.

#### **Update on previous actions under WP T2:**

- Sahar uploaded PPT of her presentation of REAMIT to students at BED to SharePoint.

**Action: For analytics partners to investigate on what the HMF exactly needs and what we can do, and what is extra.**

#### **WPT3 Business Development**

- There is an ongoing publication by James, Tamirs, and Xavier, which is a review paper which is planned to be sent to MDPI sensor journal.
- Tamiris already submitted her paper to a journal of life cycle assessment (LCA).

#### **WP Long Terms**

Research publications

- Sahar mentioned that there is an ongoing review paper at BED by Sahar, Ram, Yan, and Tahmina, which is under progress.
- Joy mentioned an interesting point for publication to consider the effect of vehicle for transferring the milk.

**Action: All partners working on research publications to communicate and cooperate more to avoid working separately on similar publications.**

#### **WP Communication**

- The website is updated based on latest information update.
- Sasha said we need information from communication officer, and the project officer.
- It is confirmed that the application form is approved.
- Sasha will upload the new information about REAMIT (extension date, new budget, etc) in the website when all updates have been finalised in eMS and updates in REAMIT AF in eMS have been finalised.
- Ram said that the application form is not completed yet, therefore, it is not approved yet, so Sasha change the Interreg project site.
- Yan will be the main contact in BED.
- University of Essex will be added to REAMIT as a sub partner of BED.
- Sasha said that news and blogs all updates are provided.
- An interview with Ram from University of Essex by video production company has been delayed.

**Action: Sasha to rearrange the filming regarding interview with Ram by Rich, the next week**

**Action: Sasha to start developing the next REAMIT newsletter.**

#### **WP Management**

- Ram and Kate are working on updating REAMIT application form in eMS with new budgets for partners due to project extension.
- Due to shortage of finance staff at BED (two staff members at BED previously responsible for preparing paper work for audit of REAMIT, left BED at the end of 2021) audit of progress report 3.1 is still ongoing at BED.
- RAC/WP/RSC meeting on 6-7 July 2022 will be hosted by Whysor in the NL, as a hybrid event (physical and on line participation will be possible).
- Visits to companies' sites will be arranged before/after RAC/WP/RSC meeting in July. Possible companies to visit: BIOGROS (Luxembourg), Picnic (NL), maybe VHG (NL) and Landgard (Germany)

**Action: Kate to ask Imke for confirmation about on-site visits to pilot test companies before or after RAC/WP/RSC meeting on 6-7 July 2022.**

**Action: Partners to ask their line managers to extend contracts following REAMIT's 12-months extension.**

**Next REAMIT sub-group meeting to be scheduled on 18 May 2022 at 10.00 am – 11.00 am.**

## REAMIT sub-group meeting, 20/05/2022

Attended by Katarzyna Pelc, Gautam Samriya, James Gillespie, Tamiris da Costa, Xavier Cama, Sahar Ahmadzadeh and Joy Eze.

Apologies: Sasha Bennett

### WP T1

#### **Picnic** (pilot test lead: Whysor)

- Picnic had been in contact with Imke. They expressed they want to continue working on the pilot test and they even sent some data.
- Whysor believes there are some challenges to be faced. Previously installed sensors broke because of the heavy load. They are considering an arrangement of three rings instead of two.
- Picnic is cooperative once again.

#### **Biogros** (pilot test lead: Whysor)

- Biogros pilot is also going ahead. Whysor is preparing the dashboard for this pilot test and they would like Biogros to decide on which parameters they want to have, e.g. when do they want data sent, how often, etc.
- As of now, 7 sensors have been installed and 6 additional ones will be installed in the future.
- The onsite visit at Biogros that was planned for the 5 July 2022 has been now confirmed.

#### **Van de Huijgevoort** (pilot test lead: Whysor)

- Whysor has been testing 2 pressure sensors in Whysor's facilities. They are satisfied with the testing carried out and want to proceed installing them in Van de Huijgevoort sometime in June 2022.

Note: Imke is currently working only two afternoons in the REAMIT project.

#### **Burns Farm Meats** (pilot test lead: UCD)

- The current challenge is getting the equipment purchased in due time. The manufacturer of the desired sensors is currently out of stock and other suppliers may need to be approached depending on the estimated date for new stock. Also, Xavier was waiting for feedback from the school buyer at UCD regarding the placement of the purchase order.

#### **Musgrave** (pilot test lead: UU)

- A date has been set for installing the second 2 sensors, the 28 May 2022.
- Also, a date set for the filming of the documentary on the 27 June 2022.
- Musgrave's initial data looked correct. Some analysis was being carried out to define the desired thresholds and alerting system. Musgrave wanted alerts when temperature goes above minus 18 degrees Celsius. However, the freezer does not actually run at -18°C or below, and James is looking at the data so that they do not receive alerts too frequently.

#### **WD Meats** (pilot test lead: UU)

- No news were received from Mark (WD Meats) regarding the variation of weights for the dry-ageing chamber trial.
- James Dooley contacted James (UU) about the DNA: they still have not received it, and they are not sure if it has been dispatched. They are following up internally. James Dooley would expect that it will take 2-3 weeks.
- James (UU) to talk to Mark about parameters that can be changed for the dry-ageing trial.

#### **HMF (pilot test lead: BED)**

- The onsite visit will take place on 23 May 2022 at 10 am.
- Sahar will bring the new sensors with her. Also, the equipment needed for the installation of these sensors (e.g. screwdrivers) had been purchased.
- Kate wondered if more batteries for the sensors were needed. James confirmed from the battery readings in the dashboard that there was quite enough power left in them.
- Kate wondered if Marco at Whysor should be contacted regarding the configuration, if it was done already. James mentioned he had contacted Marco with regards to the binary sensors. He needed to upload a new configuration as the sensors were only connecting every 12 hours.

Note: The team visiting HMF on 23 April, discussed some details regarding travel and accommodation. Kate had a car at her disposal and could pick the others up at around 09:00 am to have plenty of time.

- Kate asked Sahar if she had a chance to take a look at the sensors. Sahar said she was trying to log in the Whysor dashboard to retrieve some details/screenshots but she could not log in. She had sent an email to Imke about it.
- For the visit, some screenshots of the data to show to Natalie were needed. James to send screenshots of the data in the dashboard as he confirmed he could log in.
- Kate raised a point concerning data analytics, what could the team show to Natalie (HMF) during the visit. Sahar had asked Gautam to send her a presentation he prepared for a WPT2 meeting, and she was going to use some of the slides to show to Natalie. Gautam asked for caution in presenting those slides as the information/analysis in them was not necessarily conclusive. Kate asked Sahar to send this presentation to Ram, James, Gautam, herself and the rest of the team.

#### **Yumchop (pilot test lead: BED)**

- Visit: Kate was arranging an online meeting with Marco to help fix the installation of the sensor at Yumchop; Tamiris will be asking LCA related questions; filming at Yumchop will be carried out.
- Kate will be sending an email to the team visiting the premises with all the necessary details for logistics and travelling.

In summary, the team was quite ready for the two planned visits taking place in the UK. A total of 6 people would be visiting Yumchop, and 8 HMF (Kate, James, Tamiris, Sasha, Sahar, Ram, Tahmina and Rich).

- Tamiris asked on a possible visit to the server facilities. Katarzyna mentioned that it was difficult because of security measures and procedures, but she could try to arrange it if desired by colleagues.

**Action: Kate to arrange a visit to the Big Data server at BED for Tamiris and James.**



## WP T2

Updates from Sahar Ahmadzadeh (BED):

- **Server maintenance:** Sahar could connect to the server successfully last time she checked.
- **Data analysis:** Sahar was going to ask other partners for inputs regarding data analysis for the next WPT2 meeting.
- The date for the next WPT2 meeting was likely going to be 10 June 2022 (double-check needed).
- The minutes from the previous WP T2 had already been completed.

Updates from Joy Eze (BED):

- Joy confirmed the server was working well as she had checked the day before; there were no concerns for the time being. However, Joy needed to arrange a meeting with technical partners in the following week because the data was not updating automatically. Joy would wait for Whysor as they were supposed to transmit data the day before and she wanted to be able to confirm that they had uploaded the new data. The last upload of data from Whysor on 5 May 2022 did not update automatically in the shared instance. Joy was going to check if new incoming data was correctly synchronised.
- Kate asked on a meeting that was held by Joy and other data analytics partners on the previous Friday. Joy wanted to ask questions on the dataset (HMF) since she had interest at looking at the data and inferring the weather conditions during transport of the milk.

Discussion:

- Kate explained that Ram had been mentioning/observing that he was expecting more in-depths analysis to be presented at the WPT2 meetings.
- James explained/provided a summary of previous results that had been presented such as: the rate of change by Gautam for HMF - based on two different dates and to be linked with external weather data in the future; Jean (SenX) had extrapolated data, presented how temperature of the milk would continue in time based on his modelling; and from UU, they were looking at regression models to see how temperature was going to be affected based on external weather data. Also, additional sensors at HMF will give a substantial amount of data during the summer relevant for predictive modelling.

## WP T3

- No updates from Tamiris. She was organizing the necessary data to collect prior to Yumchop and HMF's visits. She was also waiting for the case studies questions from Usha.
- James was going to speak with Elaine (UU) that same day. Elaine wanted for James to carry out an Osterwalder canvas analysis on each case study.
- James proposed to ask questions related to the Osterwalder canvas during the conversations with Yumchop and HMF.
- Kate was going to send an email to Usha about the questions for case study development.

## WP Management

- RAC/WP/RSC meeting: the agenda invitation should soon be sent to partners: Sahar was finalising details regarding the locations with Imke, and Sasha regarding the Eventbrite page and confirmed speakers. The minutes from the previous meeting was also going to be sent out together with the action log.

- There were still some issues regarding audits at Bedfordshire which prevented from closing the report. There were problems claiming costs for some partners. Currently, efforts were made on solving those issues.
- To open the new report, Kate was waiting for different partners to provide inputs so that the (previous) report could be closed and hence open the new one.
- Ram was also having some issues with tables on the eMS system: waiting for Peter Campobasso to assist in this matter.
- It was confirmed that there would be on the spot checks at BED in Luton this summer 2022.
- Received input from the home office regarding personnel check for Elias: all clear to proceed with contracting him.
- Kate would work on a new contract for Joy.
- Given the issue with Xavier's contract, Kate asked for REAMIT colleagues to check the status of their contracts with their respective line managers.
- Regarding the previous sub-group meeting, Kate had corrected Sahar's notes. Final version had not been uploaded in Share Point. **To be uploaded by Sahar.**

#### **WP Communication**

- There had been some new communications related to events and news. Sasha was not present at the time: Sasha to make updates on the website and social media channels plus newsletter with latest inputs.

#### **WP Long term**

- Research publications: there was a discussion about it not long ago. Kate requested Sahar to include more information about the different publications partners were working on. It was planned to have a longer discussion about publications during the RAC steering committee in July 2022.
- Sahar asked how to proceed with regards to getting inputs from partners on publications they were working on. Kate suggested not only to provide that the type of research article, but also to provide a short description on what it is about.
- Colleagues discussed on whether to share this information with the large group. James was happy to share this information internally within REAMIT but not beyond. Sahar and Joy pointed out the benefits of sharing this information internally.
- In the steering committee session, talks will be held regarding research publications being developed by the REAMIT team.

#### **Final discussion**

- Joy asked on whether she could publish findings based on literature review and HMF data as she did not have a medical background. Kate suggested that this question should be brought up to Ram and other senior colleagues. It was pointed out that it would likely depend on the claims made on such publication.
- Joy asked the team visiting HMF to gather as much information as possible.

Note on RAC/WP/RSC meeting:

- A visit to Biogros is confirmed for 5 July 2022 (Tuesday) at 10 am. REAMIT meetings will be on 6 and 7 July in Eindhoven, the NL. Imke is waiting for Picnic to confirm a visit at their facilities either Tuesday or Friday.

**Date of next meeting: 9 June at 11 am.**



## REAMIT sub-group meeting, 16/06/2022

Attended by Katarzyna Pelc, Tamiris Da Costa, Xavier Cama, Sahar Ahmadzadeh, Joy Eze, Sasha Bennett, and Gautam Samriya.

### WP T1

Running pilot tests:

#### **HMF** (pilot test lead: BED)

- Some partners visited HMF on the 23rd of May (Ram, Kate, Sahar, Tahmina, James, Tamiris, and Sasha).
- All the sensors were installed with the help of James.
- Some footage was taken by Rich, which could be very good material for the July newsletter.
- Tamiris collected some data for life cycle assessments.

#### **Yumchop** (pilot test lead: BED)

- Partners visited Yumchop on the 25th of May (Sahar, James, Tamiris, and Sasha).
- There was a visit to the freezers and fridges of the company and an interview with Aby and Michael. Rich was filming and Sasha was interviewing.
- Sahar and James did a presentation about the project and the data collected so far.
- James had a phone call with Marco from Whysor because of the connectivity problem with one sensor.
- The case studies were reviewed.
- Tamiris collected some data for life cycle assessments.
- Abby expressed her intention of including sensors at all vending machines (20 in total), rather than just having the sensors placed at Yumchop directly.
- According to Marco, it will be a bit difficult to establish a remote connection for each of the sensors in the vending machines, the problem would mainly be connectivity and getting a stable Internet connection.

#### **WD Meats** (pilot test lead: UU)

- Clostridium bacteria: It's a little problematic at the moment, but WD Meats and Ulster aim to collaborate to identify the source of Clostridium bacteria.
- The DNA they purchased from UCD was dead, so they purchased and from another source.
- Ageing chamber: the second trial ended in April and James is waiting for input from WD Meats on the weights of meats so they can compare the loss of the meats and then decide on the temperature, and humidity settings, and how to distribute the meats for the third trial.

#### **Picnic** (pilot test lead: Whysor)

- They are back on board.
- They shared some data on trips, but any data coming from them are arriving at the big data hub.

#### **Biogros** (pilot test lead: Whysor)

- They have installed 7 sensors in different areas of the warehouse: salad departments, fresh food in coming, potatoes department, etc.
- BED is in the process of purchasing 6 new sensors. According to Kate, obtaining permissions internally is challenging, so she is waiting for input from Imke about cost comparison from different suppliers and justification for their chosen supplier.

**Van de Huijgevoort** (pilot test lead: Whysor)

- Two separate pressure sensors are being tested at the Whysor office before installation at the company's premises.

**Musgrave** (pilot test lead: UU)

- In April UU installed sensors in two zones, chill and freezer zone inside the lorries (3 in total).
- The dashboard has been set up for three staff members at Musgrave to allow them to monitor the vans.

**Burns Farm Meats** (pilot test lead: UCD)

- Issues were observed to get the suppliers in the system. There was a supplier that was out of stock, but now the purchase order is in the system, pending approval.
- It's 10 temperature and humidity sensors, the gateways, and batteries for the sensors.
- Supplier: Connected things, UK. Shipment and insurance included.
- Xavier sent a text to inform them that there was a bit of delay and will get back to them when it's certain that the order is being delivered.
- James and Gautam will help with the configuration of the sensors.
- Total price of the sensors: 1400 €.
- Xavier checked a few suppliers; one didn't have exactly the sensors that they wanted, and the other was out of stock. Kate recommended keeping this information filed for audit.

**Raman Spectroscopy** (pilot test lead: UoN)

- In June they are hoping to bring the pilot test to real conditions.

**Glenn Africk** (pilot test lead: NTU)

- This pilot has now been terminated.
- They signed a nondisclosure agreement, but NTU isn't sure how to proceed to terminate the pilot test. REAMIT does not have any kind of official process when a pilot test has been terminated. The project installed one sensor and one gateway and now arrangements are necessary to collect the equipment in Liverpool and deliver it to Imke.

**Storytelling:**

- BED had developed the template for storytelling. Images & Réseaux have amended it and sent it out to partners. The deadline to present the first drafts (no more than 3 pages) of those materials to storytelling is on the 23rd of June.
- The draft should include the presentation of the pilot test company, short history, location, activity, and company recruitment (how and when the company has been recruited for the REAMIT pilot test). issues and challenges faced in terms of food waste by the company, the selection of relevant sensors, assessment of the best technologies according to the needs of the company, the installation of the sensors, implementation of the sensors, and relationship with the community through the pilot test. How you have been exchanging with the people (via e-mail / in person), the number of people involved, the willingness of the company, etc.

**WP T2**

- Related to the maintenance of the server, Sahar last week received an e-mail from Joy, and she checked the connectivity, and everything was working very well. However, on 16 June 2022 Sahar received an e-mail from Andrew saying that there were some network tests ongoing, so connectivity issues may happen during the day.

- Related to the data analysis, Sahar hasn't received any new slides from the analytic partners. However, she did some data analysis using some prediction methods.
- Sahar received an email from Davinder. He asked her to return the Blue Maestro sensors and a mobile phone to him. Sahar sent an invitation for the meeting with Davinder, Kate, and Ram, etc. on the Blue Maestrp system and Levstone APP, but no one was available at that time. She is looking for a new available slot.
- Related to metadata requirements. Joy sent an e-mail with a doodle poll to schedule a meeting on 17 of June. However, it is on the same day as the annual research conference in BED that Sahar and Kate will attend the conference.
- Joy tried to check the server and the data, and she was not able to access it because most of the instances have stopped running. Most of the functions are red. So, when she tries to start it's showing it has failed. She was also not able to confirm if data from Whysor is coming. The last data is from May 2022 and there is no current data from June.
- Gautam suggested sending an email to Whysor to check the last time they add any data to the server.
- The problem with no data in the server would need to be fixed. So, the partners have some data to present the analysis at the meeting.
- Kate suggested sending a doodle pool to schedule the next WPT2 monthly meeting.

### **WP T3**

- UCD collected data for the LCA analysis during the last two visits to HMF and Yumchop. Tamíris is modelling the data and expects to present the results in the next REAMIT meeting.
- UCD received information from the Big Data Server, the amount of data used from each pilot test, and the remaining data from the server. They still need energy consumption and the total capacity of the server.
- Tamíris checked the data with Sahar and Joy because the total allocated space for each pilot was almost completed and the remaining capacity was a few megabytes.
- According to Joy, it is not possible to differentiate the servers in the Big Data server room at BED and calculate the energy consumption for each one. But she mentioned the server has enough space and the project hasn't even used up to 5% of the storage capacity.
- Joy and Sahar will double-check the information sent.
- Tamíris received an email from Sahar as she would like to help with the review paper. Tamiris suggested that Sahar could help Xavier with the results section as the deadline to publish in the Special Issue is approaching.

**Action: BED to provide information to UCD on energy consumption and the total capacity of the server.**

### **WP Communication**

- A documentary video is being produced. Rich has visited Musgrave in Belfast, Human Milk Foundation in Hertfordshire, and Yumchop in Northamptonshire. So, three pilot tests have been covered already.
- The next step is for Rich to film the University of Essex and the interview with Ram. A visit to the University of Bedfordshire will be also arranged to interview Kate, Sahar, Yan, and Tahmina.
- Rich will also be visiting Nottingham Trent University to get a brief interview with Sasha and Usha. To cover the main partners, especially the pilot test partners.
- Sasha and Rich will be traveling to Biogros on the 5th of July. Rich will be also covering the meeting in the Netherlands.

- Kate also recommended contacting the French partners to film some interviews (Ali, Gerard, and Omar), as well as Images & Réseaux and Valorial.
- The upcoming newsletter (mid-July) will feature the RC meeting and all of the events that have happened in the past two to three months.
- Sasha will send out an e-mail to partners requesting any further info or anything else that they'd like to feature in the upcoming newsletter.
- Sasha will be sharing on social media about the REAMIT visit to Biogros and the RSC meeting in the Netherlands.
- Biogros are happy for us to publicise this on social media.
- Some new posters have been developed and also the previous existing posters have been improved. REAMIT now has a new logo banner, which includes the logo from the University of Essex, as they've been added as a new sub partner, as well as an updated version of the Nottingham Trent University logo. The budget and timeline have been updated on the previous posters as well.
- Kate recommended updating the information about the visits to HMF and Yumchop on the website.
- The information about the new events is not following the previous structure. Kate recommended Sasha adjust the title and subtitle and remove the agenda. Include Ram's presentation with Abby on the 22nd of May. Should also be advertised that Sahar and Kate will be presenting at the Bedfordshire conference. Kate will also write a short note about it.
- The communication strategy document has been updated. Sasha has uploaded the latest version of it on SharePoint. It has been updated with the more recent communication that NTU has done in the past few months, such as new posters, a new logo, banner as well as information about the upcoming documentary and all the events that REAMIT partners have attended and spoken out in the past six months.
- Sasha asked about the justification sent the year before to Matthew, if that should cover the inquiry that Peter has. When BED submitted their reports 3.2 for the period July, December 2021, Peter Campobasso at INTERREG sent several questions requesting clarifications about the websites and if we received the green light from his previous colleagues to have a second website because normally the program doesn't support a second website. Sasha has justified and Matthew responded that programme normally does not support the costs related to setting up a parallel project website and left a final decision up to project partners.
- According to Sasha, the cost of having the second website was less than £2000.
- If they don't support it, the project wouldn't be able to claim this cost and this cost would need to be covered by Nottingham Trent University.
- Kate is happy with the poster of the HMF pilot test. The graph looks nice, and the picture is beautiful. Sasha will send it to Natalie for final approval. Kate will print it for the Annual Research Conference at BED (on 17 June 2022) and show it to other participants.

### **WP Management**

- Everything for the RAC/WP/RSC meeting is now confirmed. The agenda has been sent by Sahar.
- It's a hybrid event. Online participation and physical participation in the Netherlands.
- Partners should be registering now.
- Biogros visit is programmed for 5 July at 9 – 10 am. The location information was sent. People attending Biogros visit include, at the moment, Ram, James, Tamiris, Xaiver, Sasha, and Rich.



- Sasha requested partners to register on the Eventbrite page for the meeting if partners will attend online or in person.
- Progress reports are required by end of this week for the current programming period, which is January to June 2022.

**Next meeting to be held:** 27 July, at 11 am.

## REAMIT sub-group meeting, 26/07/2022

Attended by Katarzyna Pelc, Gautam Samriya, James Gillespie, Xavier Cama, Sahar Ahmadzadeh, Joy Eze and Sasha Bennett

### WPT1 Pilot Tests

#### Yumchop, UK

- James says Marco has given him 1 test sensor to fit into the vending machines.
- It is with James in Belfast and possibly will fit around 8/9 August 2022 to fit in vending machines in and around central London in various train stations.
- They want to try one sensor to see how the signal and connectivity is affected, i.e the sensor being fitted in an underground station.

#### HMF, UK

- Imke requested a meeting with HMF about the dashboard. Kate sent a doodle poll about it which does not indicate any slot available for all in August. **Action: Kate to send an email to all to consider more time slots to meet in August.**
- During visit at HMF in May 2022, Natalie invited Kate to dinner over summer to discuss engaging with investors to obtain funds for REAMIT work with HMF after the closure of the REAMIT project in July 2023.
- **Action for Kate - To propose dates for dinner with Natalie (HMF), following her invitation.**

#### Picnic, The NL

- No updates.

#### Raman Spectroscopy, UoN

- No updates.

#### WD Meats

- JG had a meeting last week with James Dooley. He is preparing the clostridium DNA for the PCR machine. The DNA samples will be ready today and will be able to run the samples on their machines.
- A site visit has been arranged for the 3<sup>rd</sup> of August at WD Meats, Tamiris will carry out her LCA study and Mark will show everyone around at the Abattoir.
- A new dry-ageing trial will be launched on the 3<sup>rd</sup> of August.

#### Musgrave

- Rich will be returning to Belfast to do some filming at Musgrave with James on a weekend soon.

- No major updates.

### Biogros

- Kate is working with Imke on sorting out an issue with invoices. The sensors that were shipped to BED need to be paid for. This will be sorted between BED and Whysor. Part of BED's budget will be transferred to Whysor to cover the cost of the sensors (through minor modification procedure in eMS). **Action: Kate to action modification in REAMIT AF in eMS.**

### Pilot test at UCD, IE – Burns Farm Meats

- The equipment delivery was delayed by the courier, but it will be delivered soon for this pilot, soon they will schedule a visit.
- Xavier will need to learn to configure the gateway and the sensors. James and Marco will help with the configuration process.

### WPT2 – Big Data Hub

- Sahar met with James last week. There's some data sent from Marco at Whysor, to transfer data from Whysor instance to the BED instance. There's an opportunity to now develop an API to transfer data from Whysor cloud to BED cloud.
- An email has been sent from Sahar to IT at BED to fix the ongoing VPN issue.
- A doodle poll has been sent for the next WPT2 meeting, still not complete so Sahar is requesting for people to complete this.
- Sahar tried to arrange a meeting with Levstone about the app. They will discuss the development of this app in the upcoming WPT2 meeting in August.
- James has been in contact with his colleagues Pratheeb and Daniel at UU about development of an app with students. There will be a meeting following this to discuss this.
- Analytic partners will be requested to analyse the new data sets for the upcoming WPT2 meetings.
- We discussed improving Gautam's document on what data analytics team can offer to pilot test companies. As a starting point, we discussed improving the document focused on HMF.

### WPT3 Business Development

- Tamiris is working on LCA Papers for the special issue.
- Tamiris is planning a workshop in September to present HMF and Yumchop's LCA results to Natalie and Abi. September or October will be a good time to present this, to get results for her paper.

- James met with Xavier about WPT3 following the RAC/WP/RSC meeting. Activity 2 is due for a July 2022 deadline, but Ram has said it is fine to move this deadline to December 2022 instead. This was supposed to be a questionnaire development which hadn't fully been defined yet. It is now imperative to get that questionnaire completed and sent out, so we can get the results back by the end of December 2022.
- Ram is considering setting up REAMIT spin-off company at BED or Essex University. Kate and Ram are currently exploring this.
- **Action for Kate: to ask Yan about the calendar to advance the questionnaire to be sent to agri-food companies regarding their plans to use IoT sensors.**
- **Action for Kate: to advance work on REAMIT legacy (explore how to set up a REAMIT spin-off company after July 2023, identify network of impact, philanthropy, etc. investors who can be approached in the future for venture capital for the REAMIT spin-off company)**

## WP Communication

- Newsletter – the July edition has now been published on both websites and on social media.
- The newsletter has been sent to Nelleke at the University of Essex, the press officer who recently released the REAMIT press release. This will be shared on their social media channels.
- Sasha and Rich Osborn of Type40 Creative have been working closely together on the REAMIT documentary video. They have had multiple meetings and visits to various partners and pilot test companies, recording video for the documentary.
- So far, we have filmed Yumchop, HMF, Musgrave, Biogros, Uni of Essex and Whysor. The Biogros interview was filmed in German language, so this requires a translator who Rich has available, this will be for the English subtitling. This will be same service offered for any other pilot partners who plan to conduct their interviews in another language.
- The next step is to visit partners in France such as Images and Reseaux and University of Nantes. Sasha will be in contact with French partners. In this, we will discuss the pilot test in France, as well as Images and Reseaux being the lead on WPT1.
- Sasha also suggested conducting interviews in Luton at BED interviewing Kate, Sahar, Joy, Yanqing and Tahmina. BED as lead partner it is important to feature them in the upcoming documentary. NTU will also be interviewed on WP Communication.
- Once the REAMIT project ends, it is important that the website is still live for a further 2 years, although Squarespace only allows 1-year subscriptions.
- **Action for Sasha – to find a hosting platform that will keep the website live for a further 2 years after the project has ended.**
- A meeting is to be held soon with Memona and Adrienne from Valorial in the first week of August to discuss the plans for the upcoming Symposium on the 6<sup>th</sup> December 2022.

- Sasha has been working on multiple posters. Currently, she is working on the Biogros poster with Imke. It is difficult to keep in touch with Imke as she only works 1 day for REAMIT. Awaiting response from Imke to develop a poster on Picnic once she is available.
- Awaiting confirmation from James that the Musgrave poster has been approved for his paper submission.
- Sasha confirmed that deadline for filming the REAMIT Documentary is to complete filming by August/September 2022 so that we can focus on editing in October and have the final documentary piece ready for November to be broadcasted. Kate suggests it will be great that this will be ready for the 4<sup>th</sup> REAMIT Symposium in Dec-2022 so we can showcase it there.

## WP Management

- Kate thanked Sahar for helping organise the RAC/WP/RSC meeting hosted by Whysor. Kate also thanked all partners who took notes for the minutes. All partners have confirmed they can access the Zoom recordings from the meetings.
- **Action for all partners: to send to Kate and Sahar by end of August their part of minutes from RAC/WP/RSC meeting.**
- Now is reporting time, it is time for partners to submit their reports to the lead partner via EMS. Some partners are currently having their audits and some have yet to start. Deadline for partners to submit their reports to LP is 15<sup>th</sup> of August.
- REAMIT Zoom subscription has been extended for another year.
- Queries from the joint secretariat to REAMIT progress report 3.2 have been addressed by BED with inputs from PPs, and JS has approved the report 3.2. Payment will be received by BED in the next few days, and funds will then be distributed to partners.
- Kate is now preparing for audit at BED. It will be a new experience as BED sub-partner UEssex is now on board and included in report 4.1 for the first time. **Action: Kate to discuss with auditors procedures for audit with sub-partner UEssex.**
- New temporary contracts for visiting staff are being discussed at BED. **Action: Kate to complete work on several visiting contracts based on input from Ram, Yan and HR.**

Next REAMIT sub-group meeting to be scheduled on 17 August 2022 at 11am.

## REAMIT sub-group meeting, 16/08/2022

Attended by Katarzyna Pelc, Gautam Samriya, James Gillespie, Sasha Bennett, Sahar Ahmadzadeh, Joy Eze, and Xavier Cama.

## WP T1

#### HMF

- Kate said she had no updates from Human Milk Foundation regarding meeting with Whysor on dashboard and dinner with Natalie. No response from Natalie but she may reply after summer holidays.

#### Yumchop

- James said that a planned visit on the 7<sup>th</sup> or 8<sup>th</sup> of August to install sensors at Yumchop's vending machine in London did not happen as Abi did not respond to James's email regarding the proposed dates for the visit. James will follow up on it with Abi later in August or September.

#### VHG

- Kate said that Imke confirmed that Whysor installed two pressure sensors last week.

#### Landgard

- Kate said that Whysor is going to install temperature sensor, VOC sensor and a gateway this week.

#### WD Meats

- James, Tamiris and Xavier visited WD Meats on the 3rd of August, and also visited James Dooley in his lab at Ulster. The team was able to collect the Clostridium DNA from him and deliver it to Marc (WD Meats). WD Meats have now run the Clostridium and got their results.
- James was waiting for James Dooley to send the results obtained in his lab at Ulster to benchmark and validate the accuracy and specificity of the device at WD Meats.
- Their issue was that the controls, both positive and negative, sometimes do not pass. With James Dooley's collaboration, the reason why that happens will be assessed to try to help them more accurately perform their Clostridium testing on site.
- A discussion with Ram is needed on whether this work fits within the REAMIT project as this is not IoT anymore. **Action: Kate to ask Ram whether CB pilot test qualifies as pilot test for REAMIT.**
- **Action: James to follow up with Ali from UoN because he had mentioned that their Raman spectroscopy device could be used in the work on Clostridium DNA. Ali saw potential for carrying out work with Raman spectroscopy with collaboration with UoN. James will contact UoN about it in September.**
- While on the visit, Tamiris was able to collect some data for LCA assessment on site and gain some knowledge on their processes.
- James said that the third dry-aging trial was launched on the same day at WD Meats.
- Kate asked about the location of the sensors, if they were inside the factory or in lorries, and where the dry ageing process was taking place. James confirmed that the sensors were in the lorries. Marc takes them off at the end of each chill and then puts them in his office. He then later needs to place them again in a lorry. Each time REAMIT sensor monitor dry aging chamber for three weeks. Dry ageing takes places in lorries parked outside the building. They are big, refrigerated lorries, each holding 150 hindquarters, and they have about ten of them.

#### Musgrave

- Nothing has happened at Musgrave from a sensor deployment point of view. James has done some analysis work but that's more WP T2.

### Burns Farm Meats

- UCD received sensor equipment for this pilot test two weeks ago. James, Marco and Xavier had been making some configuration arrangements so that the gateway was connected to the Whysor cloud and ready to deploy on site.
- There was a visit going to take place on the 30<sup>th</sup> of August. However, now the team was trying to see if we could arrange a visit combining the installation of sensors, LCA and filming on site with Rich and Sasha.
- Xavier was going to talk to Cathal Burns about it later during the day (on 16<sup>th</sup> of August) to propose this new plan as originally the plan was only to install the sensors. The proposed days for the visit are 7<sup>th</sup> or 8<sup>th</sup> of September 2022.
- Sasha mentioned that a poster and a case study would need to be developed for Burns Farm Meats. Worth mentioning to them if they would be happy for those to be published as well.
- Gautam asked Xavier if the Gateway and sensors had been configured already for Burn Farm meats. Xavier explained that Marco had configured the Gateway so that now they could see it from Whysor as well. Xavier had sent the sensor keys so that Marco could register as well and associate them with the Gateway. The idea was to be able to install the equipment quickly once on site.

### WP T2

- James confirmed that VPN issue has been resolved by Andrew and the rest of the network engineering team at BED. Partners should be able to re-access the database in real time and without the need for CSV files to be sent around. Partners need to send to Andrew both their serial number of their computer and their MAC address. Andrew has listed out how to retrieve both of those pieces of information in an e-mail. James had sent an email to partners about this. **Action to all: alert James if someone was missing on those emails.** Gautam had sent his credentials to Andrew who was working on providing access to Gautam.
- Gautam, Marco and James had a few meetings in past few weeks regarding real-time, synchronized data transfer exchange between BED server and the sensors. So, not from the Whysor cloud, directly from the sensors. Gautam/James said there is the possibility of implementing a software solution from which we can directly access the sensor data in real time. It was still initial work, and it will still need some time to be implemented. After 20/08/2022 Gautam, Marco and James were going to have a discussion on this to keep on making progress. Kate asked who was involved in the development of this software solution. Gautam had volunteered to work on implementing this software solution with help from Marco and James.
- Re WPT2 meeting, Sahar confirmed she had sent the Doodle poll about it but not all partners responded. She will double check today and set a date for it. Kate asked Sahar to perform this action soon and announce this meeting in advance. Sahar will check whether the key data analytics partners have already replied to the Doodle. **Action: Sahar to action the decision on the date for the next WPT2 meeting and send calendar invitation to partners.**
- Kate said that there was a meeting with Whysor some months ago to discuss the scope of their involvement in WP T2 meetings. Kate explained that following Whysor's request, it was agreed that

Whysor would not need to attend entire WP T2 meetings, but be available for the first 30 minutes to address questions related to connectivity. Tom or Marco will be attending WPT2 for the first 30 minutes. The agenda of WP T2 meeting should be aligned to this agreement and Q&A session should be at the start to get Whysor's feedback. It was suggested to spend less time on 'previous minute's acceptance' and rather on actions and Whysor's input.

- **Levstone APP:** Partners asked about the Levstone APP and whether Levstone will adapt the APP to REAMIT or a new APP will be developed. Kate said some weeks ago there was an email exchange about it between Sahar and Ram, and Ram suggested a separate meeting to discuss Levstone APP, but she had no update about it. James said that it would help to have a meeting about desired features for the new mobile app. A requirement list would be needed for the student project at Ulster – what the REAMIT team wants out of the app. **Action: Sahar to put 'REAMIT APP' as a bullet point in the agenda for WP T2 meeting to signal to partners this request.** Nevertheless, James mentioned that a separate meeting on mobile APP is desired as at RAC/WP/RSC meeting Davinder did not seem to want to pursue adding features to their app. Kate was reviewing several apps of companies which were very successful and supported by investors and they are very simple apps. It is important to discuss what REAMIT app should look/be like and what it offers, because it is extremely important how user-friendly this app is. James pointed out the need to look for apps more specifically on sensor technology integration. Kate was attending recently some meetings in London for founders and investors, to understand what investors are investing in. The apps they were presenting of new founders and new companies were mostly for companies that use app as a platform to link service providers and consumers. Kate mentioned that on the session for the REAMIT app it may be helpful to have a part of the meeting dedicated to reviewing a few apps as examples for brainstorming and inspiration. James said maybe partners could go off and do their own research and choose a few apps ahead of the meeting. We could then present it at the meeting and have a discussion around what features we liked most and which we would like to be included in REAMIT app. We can then ask Davinder if he can implement those features. Alternatively, James could present those features to his Ulster colleague who will ask his students to develop an app (according to the list of REAMIT requirements) as a students' project. Kate thought we should do both in parallel: ask Davinder to see how he can modify Levstone app for REAMIT, and in parallel work with Ulster students. **Action: All partners to browse apps and share information on relevant, existing apps if they know of any, and which are their favourite apps.** Sahar volunteered to do some research on it. **Action: Sahar to present her preferred app.** **Action: Kate to find out from Ram how REAMIT will go about the app development further.**

- Joy explained that because she was not receiving/no access to her BED email address she could not follow the recent work that was taking place or attend the meetings, although she would like to.
- Kate explained that Joy's contract has not been renewed yet and it is work in progress, and that is why she was still on her private e-mail address. **Action: All to include Joy's private e-mail address in correspondence and meetings relevant to big data server maintenance and data analytics.**

### WP T3

- Tamiris was not present in the subgroup meeting, so James reported that she attended a visit at WD Meats with James and Xavier on the 3rd of August. She got the chance to ask Marc a lot of questions about the meat preparation process so that she could perform her LCA analysis.



- James said that Tamiris discovered that the whole flow of the abattoirs was a lot more complicated than she was expecting - they have many different materials they use because it is such a large company and for this reason Tamiris will probably focus on her LCA on just one small part of the process rather than trying to capture the end-to-end process.
- James said that Tamiris may need more specific information (components weight, etc) about the eagle loggers, so she can more accurately perform the LCA as she had done before for HMF.
- Kate said that the survey had been updated and sent out by Yan last Sunday. The Ulster team will review the survey and return with feedback and comments in a couple of days. The survey should be soon finalized and sent to companies. This is a survey about adopting IoT sensors by food companies.
- Kate recently attended 2 meetings in London with founders and investors, as part of her work on REAMIT legacy: 'Founders Live London' on the 10th of August to find out exactly what investors are looking for in new start-up companies; and a network meeting for VC investors on 24/06 in LBS in London.

#### WP Communication

- Sasha reported that the last newsletter was published in July and the plan was to publish another newsletter for September. **Action: Sasha to send an e-mail to partners requesting for input to this newsletter.** The July one was quite long because the one before had been in March so there was a large gap in between. The newsletter for September will be shorter. The next one following that will be in December after the 4<sup>th</sup> Symposium.
- REAMIT documentary: Sasha is working with Rich Osborn from Type 40 creative on the REAMIT documentary. So far filming had been carried out at Yumchop, HMF, Musgrave, Biogros, University of Essex, Whysor, Nottingham Trent University and BED. The only ones that we have left are UCD, Image and Reseaux and University of Nantes.
- Sasha contacted Xavier, Tamiris and Fionnuala. Probably a meeting on the 8th of September to UCD and possibly the pilot site for Burns Farm Meats was going to take place.
- Ulster University will need to get some filming done at Ulster as well. Joan indicated that she would be arranging a date to film with Rich soon. No date set up yet.
- The plan was for the documentary to be broadcasted on a local TV channel in Nottingham called NOTS TV, a digital channel on Sky TV. If anyone knows of any other local channels within their regions as well, we can hopefully get it broadcasted on a local network.
- The website subscription to Squarespace is written renewed for an extra year. Usha wanted to extend the subscription onto 2026 so that the website will still be alive. **Sasha: To investigating subscription till 2026.**
- The poster for Biogros had been completed with the help of Imke, James, Sasha, and Usha. It had been sent off to Marco at Biogros for review.
- The poster for Picnic was being developed, it was a bit difficult as Imke only worked a limited time on REAMIT (1 afternoon per week). Imke confirmed that her new colleague Rosana from Whysor will take over some of her work in REAMIT. The next poster will be the Burns Farm Meats, and Sasha would be in touch with Xavier about it. James offered help as well if needed. Sasha mentioned that Usha was suggesting we could utilize the WD Meats poster that we had previously created. **Action: Sasha to send WD Meats poster to Xavier and James.**

### WP management

- Kate said she was in the process of reporting and developing project progress report and BED progress report, this time involving University of Essex as sub-partner of BED for the first time. Kate was preparing for on the spot audit at BED on the 8th of September.
- Our modification request is still open in eMS and Kate is currently waiting for JS to approve and close it. It is modification of the REAMIT application form, as BED moved small equipment budget to Whysor to cover purchase of sensor equipment as invoice was wrongly sent to Whysor, rather than BED. BED is going to purchase new sensor equipment for Biogros.
- Kate needs the request for payment documents from all partners to action payments from funder to PPs (tranche for July-Dec 2021 reporting round). UCD, I&R and UoN have not sent it yet. **Action: Xavier to send Fionnuala a reminder as Fionnuala did not respond to Kate's emails.**
- **Action to all: Minutes of the last RAC/WP/RSC meeting to be sent to Kate by end of August/beginning of September by all members involved in the minutes writing.**
- Kate is working on VL contracts for visiting staff from BED in REAMIT.
- Kate thanked partners for their work and contribution and closed the meeting.

**Date of next meeting: 31<sup>st</sup> of August at 11 AM.**

## REAMIT sub-group meeting, 31/08/2022

Attended by Katarzyna Pelc, Gautam Samriya, James Gillespie, Sasha Bennett, Sahar Ahmadzadeh, Joy Eze, Xavier Cama, Tamiris da Costa.

### WP T1

#### HMF

- Kate had no updates from Human Milk Foundation in relation to her emails sent in the summer as well as her recent email about Yan's survey on using IoT sensors. **Action: Kate to send another email to Natalie at HMF when school holidays have finished.**

#### Yumchop

- James said that a planned visit on 7<sup>th</sup> or 8<sup>th</sup> of August to install sensors at Yumchop's vending machine in London did not happen as Abi did not respond to James's email regarding the proposed dates for the visit. James will follow up on it with Abi later in August or September.

#### VHG

- Kate said that Imke confirmed that Whysor installed two pressure sensors last week.

#### Landgard

- Kate said that Whysor is going to install temperature sensor, VOC sensor and a gateway this week.

### WD Meats

- James visited James Dooley in his lab at Ulster. He was not well for a couple of weeks.
- The team was able to collect the Clostridium until the next day.
- James was in contact with Marc and he is waiting for James' results before asking Marc.

### Musgrave

- Nothing has happened at Musgrave from a sensor deployment point of view. James has done some analysis work but that is more WP T2.

### Burns Farm Meats

- The plan is to visit the company next week on Wednesday. The REAMIT team will visit the site, do filming and install the sensors. Xavier with the help of James will install new sensors.
- Sasha and Rich will attend the visit too to interview the UCD team and take footage at the pilot test site. Hopefully after installation of sensors, the pilot test with Burns Farm Meats will be started soon.
- James cannot see the Burns Farm Meats in the Whysor dashboard yet.
- **Action: XC to send an email to Marko and Julian at Whysor to see if the sensors have been registered and connected to Whysor dashboard.**

### Glen Affric

- Sasha said there is no response yet.
- **Action: Sasha to contact Imke to discuss returning the equipment from Glen Affric.**

### Raman Spectroscopy

- James explained that Raman data is different from data from all other pilot tests and it is not straightforward that this data should be sent to the Big Data server, as it is much specialised.
- **Action: Kate and James to discuss with Ram and data analytics partners how to handle Raman data.**
- **Action: Sahar to put Raman data in the agenda of the next meeting of WP T2.**

### WP T2

- Sahar confirmed that the next WP T2 meeting is on 30<sup>th</sup> August.
- James and Gautam summarised issues with the Big Data server at BED.
- Gautam confirmed a meeting with Davinder would take place on Friday regarding the app development. The purpose of the meeting was discussion about the data obtained from HMF.
- Kate suggested Sahar to add a bullet point in the agenda of WP T2 regarding app development.
- James provided an update regarding the app development. Davinder will set up a meeting 6-7 weeks later. He is talking about a separate app. Davinder in yesterday's meeting said that the first prototype is based on the Bluemaestro.
- James talked with his colleague at Ulster on developing REAMIT app by students as a semester project. James suggested some links related to apps which may be inspirational for REAMIT app:

<https://www.kayeinstruments.com/en/cold-chain-monitoring/overview>

<https://blog.arduino.cc/2020/07/22/control-your-internet-of-things-projects-from-anywhere-with-the-new-arduino-iot-cloud-remote-app/>

<https://community-assets.home-assistant.io/original/3X/c/7/c7f0f54d11f4708c75bc11cd11dbaa5269d184c1.jpeg>

- **Action: all partners to review the apps in the links above as input to the next sub-group meeting and discussion on the REAMIT app.**
- Joy's email started working. Joy gave an update on the server, and said that everything is going well.
- Gautam worked on API integration.
- Kate shared her screen to look at WP T2 folder in SharePoint and asked partners to upload their presentations from WP T2 meetings in SharePoint on regular basis.
- **Action: Sahar to make sure WP T2 folders in SharePoint are complete and contain presentations, agendas and minutes from each meeting related to WP T2.**
- James already sent some python codes to Joy.
- James going to show pipelines to Sahar for cleaning data.

### WP T3

- Tamiris reported that during her visit at WD Meats, Marc has provided a lot of information about meat processing process. WD Meats use many different materials and their life cycle is a lot more complex than Tamiris was expecting. Tamiris was expecting just to consider consumption of electricity and packaging, while it seems more complex. WD Meats are a large company and they use many different chemicals such as e.g. they spread ammonia. However, the main problem, as far as Tamiris understood, is that they do not have inventory control over their inputs, so it is not possible to estimate the amount of materials consumed. A factory of that size, according to Tamiris, should have a department just for purchasing and counting stock of what has been purchased and used in the factory. Because of this, Tamiris' idea is to try to focus the LCA study just on the dry aging chamber, rather than trying to capture the complete lifecycle at WD Meats. Marc provided information on electricity consumption for the specific stages in Dry Aging pilot test. Tamiris can start from this point and try to find other information later by extrapolation.
- For the visit at Burns Meats Farm, Tamiris can prepare a more complete questionnaire based on her knowledge gained from WD Meats.
- Tamiris is interested in doing comparative analysis of LCA for Burns Farm Meats and WD Meats. She will use the same functional unit, for example, the amount of meat, 1 kilogram of meat, and she will compare their impact. These are companies from different countries and of different sizes, and it may be a very interesting comparative analysis but she still needs to get some data. Tamiris sent an e-mail to Marc at WD Meats to check if he can provide more details and validate the information she has collected.
- James is working on a systematic review paper.
- **Action: Xavier to follow up with Finnuala if she has read the paper.**
- **Action: Kate to discuss with Ram the progress with obtaining papers for the special issue.**
- **Action: James to send out a doodle poll and set up a WP T3 meeting in September.**
- Kate confirmed that Ram explored possibilities for setting up a REAMIT spin-off company that would continue working with REAMIT pilot test companies in agri food supply chain after the end of the REAMIT project. He was developing a pitch for a meeting at UEssex early in September.
- Over the summer, Kate did not hear back from Natalie from HMF regarding Natalie's interest in approaching philanthropy and social impact investors for funds to support REAMIT work with HMF after the end of the REAMIT project.

- Following Yan's request, Kate has sent out Yan's survey on the use of IoT sensors by agri food companies to Yumchop and HMF, as a trial to obtain their initial feedback on the survey. Kate suggested translating the survey to French and distributing it among French companies through Velorial's networks. She also suggested discussing the survey results at 4<sup>th</sup> REAMIT Symposium in Nantes in December 2022 e.g. as a round table discussion with French agri-food companies. She also suggested that a theme of the 4<sup>th</sup> REAMIT Symposium could be built around the theme of the survey. Sasha suggested translating the survey into online version and making filling up the survey more user-friendly. Sasha will include the survey (or a link to a survey) in September REAMIT Newsletter.
- James suggests a company with reasonable costs that can make the survey electronic and share it with other companies. **Action: James to send Kate an email with names of other survey companies, as approaching 3 companies for quotes will be needed for compliance with public procurement rules.**
- **Action: Kate find out how to progress with public procurement regarding the survey on IoT sensors.**
- **Action: Sasha to send an email to Ram, Yan, Lakshimi, James, and Kate regarding the survey.**

#### WP Communication

- Sasha confirmed that the next newsletter will be published in September and she is collecting input from partners. She asked partners for articles, but did not receive a response yet.
- A meeting with Memona from Valorial took place on 23<sup>rd</sup> of August to discuss the plan for 4<sup>th</sup> REAMIT symposium. A date for REAMIT 4<sup>th</sup> Symposium was set on 6<sup>th</sup> December 2022, in Nantes, France. **Action: Sasha to send an email about it to all REAMIT partners soon, so they can book it in their calendars.** The event will not be online. Physical presence only.
- The Symposium will be advertised in the September newsletter, and Sasha is working with Memona and Adrian on it.
- The next RAC/WP/RSC meeting will be in Dublin on 11-12 January 2023.
- The final RAC/WP/RSC meeting will be in March 2023, hosted by UEssex.
- September newsletter will also promote a special issue and publications.
- **Action: James to send Sasha an email regarding his presentation at UCD as input to the newsletter.**
- Sasha is going to add names of new staff members at partner organisations in the newsletter, e.g. Memona.
- Visit at Burns Farm Meats: Sasha will travel to Belfast on 6-7<sup>th</sup> September 2022 and will do interviews with UCD.
- Sasha is still waiting for the University of Nantes to confirm their availability for her visit in Nantes for filming for REAMIT documentary. Proposed dates are in September and October.
- Sasha is looking at options for REAMIT website subscription for another 2-3 years. She has already found a website that can host REAMIT website for a longer period.
- The poster by BioGros is completed. Sasha is in contact with Imke regarding the poster on the VDH group. Xavier is working on a poster for Burns Farm Meats.

#### WP Management

- Kate has been developing finance and progress reports for BED and the REAMIT project for the reporting period January – June 2022. She has liaised with finance at BED to collect paper work for audit, and the auditor to agree on evidence for audit trial with sub-partner UEssex.

- On the spot audit at BED is planned on 8<sup>th</sup> September. Kate is still waiting for some paper work from finance and salaries at BED and UEssex. Several partners have not yet completed FLC audits of their progress reports.
- Kate has now received paper work from all partners regarding request for payment from LP to PPs for the reporting period July-December 2021. Based on it, she has sent a request for payment to BED hierarchy to action payments from BED to PPs. REAMIT partners should get funds in their bank accounts within 2 weeks.
- Proposed amendment to the contract between BED and founder was developed by Research & Innovation Service at BED. Kate was involved in correcting the draft.
- Kate finalised work on issuing two visiting lecturer contracts for one visiting staff at BED. Both contracts were issued in August. It took 4 months and multiple exchanges with BED staff and HR before these contracts were issued. More VL staff will be employed in 2022 at BED to support the implementation of the REAMIT project.
- Kate asked partners for their parts of minutes from the RAC/WP/RSC meeting in July 2022, so she can develop consolidated minutes. Partners agreed to send it to Kate by end of August/ first week of September.
- Kate asked partners to save their presentations in the SharePoint on regular basis. This will facilitate her reporting work when developing the REAMIT project progress report.
- Kate thanked partners for their contribution and closed the meeting.

**Date of next meeting of REAMIT sub-group: 14<sup>st</sup> of September 2022 at 11 AM.**

## **REAMIT sub-group meeting, 14/09/2022**

Attended by Katarzyna Pelc, Sahar Ahmadzadeh, Joy Eze, Tamíris da Costa, James Gillespie, Gautam Samriya, and Sasha Bennett

Apologies: Xavier Cama

### **WPC**

- The main focus of the September newsletter would be the REAMIT Symposium in Nantes. However, there's been some difficulties, according to the last e-mails from Mémona and Christophe from Valorial. They are having problems securing the venue for that date (December 6<sup>th</sup>), which caused some delays in promoting the Symposium.
- Regarding the proposed dates for the Symposium, Valorial has suggested the 12th or 13th of December, which could probably limit the participation of people from outside France as it is close to Christmas.
- Sasha questioned if the September newsletter should be released without the Symposium because it is the most important news that should be promoted.

- Kate recommended waiting two weeks until the confirmation from Nantes to announce the Symposium in the following newsletter. The draft agenda and the online link are also not available. In the meantime, Sasha is preparing other content.
- Sasha didn't get much input from partners regarding the articles for the next newsletter, except for the article she received from Kate. For this reason, she will focus on the new members of the team (e.g. Mémona and Rosanna), the visit to Burns Farm Meats, the survey, the Special issue at Sustainability Journal and the University of Bedfordshire's research conference.
- There's also a new poster from Musgrave created by James that can be featured and his presentation at the European Federation of Food Science and Technology (EFFoST), held in UCD from 7-9 November 2022.
- **Action Sasha: Send an e-mail to Usha and Ram with the proposed content and the newsletter's first draft, mentioning the Symposium's inclusion.**
- Regarding the documentary's progress, a trip to Nantes is planned for October 7th. The visit includes a tour of the laboratories of the University of Nantes, interviews, LCA data collection and a chance to meet the team from Images and Reseaux. Sasha won't be able to join the trip, but Usha will be representing NTU. The Routhiau company won't be available for filming on the proposed day, which also limits the LCA data collection by Tamiris. James has spoken to Ali at the RSC meeting about potentially running the Clostridium material on their Raman Spectroscopy equipment, and he could deliver the samples during this visit.

## WPT1 Pilot Tests

### HMF, UK

- Meeting with Natalie and Gillian from HMF on September 12th regarding the paper on Life cycle assessment. Natalie apologised for the silence from her side in the summer because she was inactive, but now she is responding again. Kate will be meeting with Natalie and Whysor on the dashboard. **Action Kate: Send an e-mail with a Doodle poll to schedule the meeting.**
- No updates about Sahar's conference paper on HMF. She sent the document to Natalie but hasn't received any response yet. Therefore, she plans to propose a separate meeting to discuss further inputs. Kate suggested waiting for Natalie's feedback, but she will mention the abstract during the dashboard meeting.

### Yumchop, UK

- No updates about the installation of the sensors in the vending machines.

### Burns Farm Meats, Ireland

- Sasha, Rich Osborn, Tamiris, James, Ram and Xavier visited Burns Farm Meats on September 7th. The meeting went well; Xavier installed 10 sensors and demonstrated the real-time dashboard that Rosanna had prepared. The sensors are working well, and data is collected every 15 minutes. Tamiris collected data for life cycle assessments, and Rich and Sasha filmed the interviews. **Action Xavier: setting up the dashboard and deciding on the alerts with the Meat company.**



- Credentials still need to be sent to the Burns Brothers so that they can access the dashboard. The dashboard layout is being developed to make it more intuitive based on how the sensors have been installed in the chambers. So they can see sensors where they are in the chamber.

#### **Musgrave, UK**

- James is still struggling to contact Keith and Robert, the main manager of Musgrave. He sent an e-mail last week but still hasn't gotten a reply from them. He is planning to send another e-mail this week asking for inputs for the paper in progress.
- James still got two sensors to deploy in the other two vans. Marco set up the sensors, but they were not installed yet because of the lack of communication with the company.
- Yan suggested sending the survey to the pilot companies that James was working with, but he was expecting some engagement from the company about his last requests before asking something else. As this did not happen, he will send the survey to obtain any informal feedback and responses. **Action Kate: draft a standard e-mail to send the surveys to all companies.**

#### **WD Meats, UK**

- James Dooley is off until September 26th, but he sent some results from his lab scientists before the annual leave. During the week, James was in touch with one of the scientists (Caroline) about the results she got from the Clostridium trials at Ulster versus WD Meats.
- James Dooley had anonymised the Clostridium samples from WD Meats, and the lab scientist didn't know the key James had used to encrypt it. James Dooley had prepared 10 different samples for WD Meats to run at different concentrations, and he was going to run the exact same experiment at both locations. Caroline is also engaged in improving the calibration of the WD Meats machine.
- No updates about the dry ageing. James will send Marc an e-mail to check the dry ageing progress, show some preliminary Clostridium results, and request that the survey be completed.

#### **Raman Spectroscopy, France**

- James said that data coming from this pilot test is in a different form. Ram suggested inviting the partners from the University of Nantes to attend WPT2 meetings. Xavier is another potential partner that could analyse spectra data, as his PhD is in Spectroscopy, apart from Omar, Ali and the French partners. **Action Sahar: include Ali and Omar in the mailings for the next WPT2 meeting**
- Gautam suggested asking Ali and Omar if they had instructions to analyse the spectroscopy data, so the rest of the group could also help them investigate it. Kate suggested having a part of the WPT2 (10 min slot) dedicated to spectroscopy (What they are doing, how they are doing, and what they need to do with this data).
- Gautam suggested a separate meeting to analyse how the other partners can add to it, which would require more than 10 minutes. Sahar mentioned that Ram authorised the next meeting to be 2 hours long, giving enough time to analyse the data from spectroscopy experiments.
- Kate asked Sahar to send an e-mail to Ali and Omar explaining the purpose of their invitation to the WPT2 meeting, emphasising that their participation is necessary to start looking into Raman data and checking their availability. If they are unavailable on the proposed dates agreed with other partners (September 27th), send a new doodle poll to all partners to find a date when everybody's available for two hours, including Omar and Ali.



#### Glen Affric, UK

- Sasha e-mailed Imke about the return of the sensor's equipment from Glen Affric but still hasn't heard from Imke.

#### WPT2

- **Action Sahar: Contact partners from UoN and confirm or establish a new date for the WPT2 meeting based on their input, making sure there is enough time for discussion on Raman data analysis (at least 30 minutes) in the agenda.**
- There was a temporary error last week on the Big Data Server. Sahar contacted James, and they solved the issue. The data is not being sent automatically and needs to be manually uploaded to the server by Whysor once a week. The API development is ongoing, which would send the information automatically through the synchronisation codes.
- Gautam volunteered to have an initial look at the codes over the summer. He tried to write the API code, but there hasn't been much progress. Therefore, he plans to contact James and Marco again to discuss the API writing. Marco could probably do the work in a couple of hours because he knows how to do it, but Whysor does not have a budget to allocate more time to REAMIT. However, Marco sent an example of prewritten code in JavaScript and James believed it would not be difficult to automate the synchronisation.
- LEVSTONE is working on a similar code, as real-time data synchronisation would be mandatory for how Davinder intends the app to work, so this is a crucial component for the app to function based on their proposed architecture. Ulster University is also working on a separate app as an alternative. They access the data directly using the API, but the process is not automated.
- Kate asked about the knowledge needed to write the synchronisation code. According to Gautam, it will require an understanding of writing software, specifically RESTful APIs. Kate can talk to Imke to engage Marco, but James will try to have a look at it before asking Whysor.
- James, Sahar and Joy had a meeting with Davinder last Friday. Davinder is trying to develop a simplified app for the driver driving HMF milk bags, which would start and stop journeys using a traffic light system. James believes that the Eagles installed already do this work, and an app with this function would be redundant. Davinder will have a look at integrating the Eagle as a third supported device on their platform. He plans to combine it with the Whysor data.
- Davinder's main concern is that Bedfordshire VPN wouldn't be functional outside of business hours (9:00 to 5:00 PM). However, James could log in to the VPN around 7:00 PM with no problems. Sahar discussed this topic with Andrew, and he asked for the macro address and the serial number of anyone who wants to connect to the server using a VPN externally. **Action Sahar: Contact Andrew about the VPN opening hours.**
- The Big data server has not appeared to be the most robust. According to James, the Microsoft SQL Server sometimes crashes, making it impossible to log in. The VPN also is not always completely reliable. Davinder architecture relies on both of those things, and he wants to pull it through the Big data server and not access the data directly using the Whysor API.
- Davinder said he is open to having some work on app development within four to six weeks for a driver. However, the sensors used during transportation already have trip detection, and REAMIT would need a separate app to start and stop the data collection during the trips. Despite that, he intends to have

it integrated with the Whysor database. To make the app more specific to the project, last week Davinder also requested from Sasha logos and pictures of the REAMIT project.

- The app will not be available in the App Store and cannot be used on iPhones. It will be an Android-only app, but Levstone will provide an e-mail to download it. According to James, there are ways of writing one set of code and then porting it to whichever device you want, and then it translates the code and makes two separate apps. Davinder believes the app would not be approved in the App Store in time because Google can be rigorous about security compliances and how data is handled (GDPR). The solution to promoting the app is to include it as an attachment (e-mail), and people can directly install it on their phones without downloading it from the Play Store.
- According to James, if the students from UU are engaged in the semester projects to develop an app, and they produce something nice, it could be released on Google Store/Apple Store. Some apps can also be rejected during the screening phase based on the user interface, e.g. if the buttons are too small or too complicated. In addition, launching applications on mobile platforms has an associated cost; the Apple developer annual fee is £99, and for the Play Store is around \$25.
- **Action Sahar: make sure that all folders in WPT2 are complete and contain presentations, agendas and minutes in SharePoint.**
- **Action Sahar: send a Doodle poll to the partners to schedule the next WPT2 meeting.**
- Kate asked about two documents in SharePoint. Data collection strategy from Gautam and high-level mapping from James. Gautam's file is being used as a reference. James is documenting each of the pilots, the sensor data available, quality labels, quality data, the analytics that might be performed and what data is needed from the companies, e.g. customer feedback on groceries and then linking that to food quality.
- Kate suggested focusing on one pilot test at a time, given the little time left in the project, and obtaining deep data around this pilot to do more meaningful data analytics. Biogros and Picnic seem to be the companies most interested in getting some analytics performed on their groceries. Musgrave is simply transporting generic perishables, and they're not focused on any one thing in particular. Kate suggested looking at the data and the dashboard and checking where we are getting data from. From recent discussions, she suggested HMF and Yumchop as an alternative. **Action Kate: discuss with Ram about focusing data analytics on one or two pilots.**

### WPT3

- On September 7th, Tamiris participated in the Burns Farm Meats visit and collected data for LCA analysis. The company owners were responsive to questions and provided the information requested. The only information missing is the monthly electricity consumption, but the Burns Brothers will check it and send it by e-mail.
- Tamiris will calculate the results by the end of the next week and return them to Ram so that he can compare them with his estimations of CO<sub>2</sub>eq.
- On Monday, Tamiris, Kate, Ram and Kate participated in a meeting on LCA with Natburnalie and Gillian from HMF. Natalie had some concerns about the sensitivity analysis included in the paper for the special issue. Tamiris would like to make the study more comprehensive and valuable for other companies and not so restricted to their case. Despite the baseline being based on information from the company, the sensitivity analysis would not need to be.

- Tamiris will change the analysis according to their suggestions and check what can be extracted from there. She also depends on their decision on whether the percentage of waste in transport is zero or not.
- Another paper on LCA about the Yumchop pilot is being written in the meantime.
- Tamiris has confirmed her presence for the visit to Nantes, although the Rothiau company will not be available. She can try to estimate the impacts of UoN spectroscopy equipment. However, she is unsure if that will be possible, as she would need to open the equipment to analyse each component.
- **Action Tamiris: contact Natalie about the literature mentioned during the last meeting.**
- James, Tamiris and Xavier have been working on the business landscape and sensor review, which needs to be finished by the end of September as per the application form. The paper will be submitted to the Sustainability Journal.
- UU will be responsible for getting the three quotes and processing the survey on the use of IoT sensors, partially from a budgetary perspective and partly because Trevor already has experience with survey companies. The survey is currently going through ethics at Bedfordshire. **Action Kate: get input from Ram regarding the progress with obtaining papers for the special issue.**
- **Action James: schedule the next WTP3 meeting.**

## WPM

- Kate is currently finalising the REAMIT project progress report, asking different partners for different inputs, like evidence for the auditor, because partners usually do not upload materials, e.g. presentations in the eMs.
- The BED auditor has set up a separate cloud space for all these materials and they do not look at them in the eMs report. Instead they wish to have all of these materials (proofs of progress and expenditure) in their own cloud. For this reason, Kate is uploading materials to support reporting and audit in two spaces: eMS and audit cloud.
- University of Essex, a sub-partner of BED, have provided all the paperwork and evidence of costs, which are being reported under BED's report in eMS. Kate is still waiting for some final paperwork from salaries at BED as proof of payments for BED. She is waiting for the same paper work (proof of payment) from University of Essex.
- There have been e-mail exchanges within the BED hierarchy regarding the payment from BED to partners for reporting period 3.1 (July-December 2021). This time they requested additional information, e.g. spending per partner so far, how much has been spent so far in the project, what is left to be spent, etc. Kate provided this information and expects that now payments to partners will be actioned without delay.
- BED plans to employ new visiting staff members to help with data analytics, 3D fluorescent sensors, and assist with PM administrative tasks. Three new staff working hourly based on short time contracts in REAMIT will be contracted at BED soon.
- Kate is approaching partners for their audit certificates and checklists. She needs to present it to the auditor. BED have postponed the on the spot audit at BED because they do not have all the finance input necessary to complete the finance report yet.
- The funder has approved the modification request in eMS. There was a minor modification request in the REAMIT budget, so Peter Campobasso has sent a new application form, and Ram has forwarded it to all the partners.

**Next meeting: September 28th, 11 AM.**

## **REAMIT sub-group meeting, 28/09/2022**

Attended by Katarzyna Pelc, Sahar Ahmadzadeh, Joy Eze, Tamíris da Costa, James Gillespie, Xavier Cama, Sasha Bennett and Omar Dib.

Absent: Gautam Samriya.

Kate welcomed Omar (UoN) to the subgroup meeting, who shall be joining for the rest of the project. Welcome, Omar! Kate advised that the REAMIT project application form with deliverables per each work package is available in SharePoint. **Action: Omar to contact partners at NTU (Usha and Sasha) to obtain access to SharePoint.**

### **WPT1 Pilot Tests**

#### **Raman Spectroscopy, France**

- Omar provided a quick overview of his pilot since it is his first meeting. The Raman pilot is divided into 3 stages. Stage one, the lab development and testing of the Raman sensor is complete.
- Stage two is the transition between the lab and the company. Here, the sensor is tested in similar conditions to those present in the truck, showcasing the challenges which will be faced and the solutions required to make the Raman testing easier in real scenarios.
- The analysis of the stage 2 results has just been completed. Omar is preparing an article for the special issue based on these findings.
- Regarding the last stage, Omar has contacted Routhiau in September and they have replied saying they may not have time to participate in the pilot this month. Omar will contact them again mid-late October to confirm their participation.
- As a backup plan, Omar is investigating refrigerated trucks for rental. Omar is looking for special features in order to mimic the same transport conditions as other food industries use.
- Omar mentioned that the analysis of Raman sensor data is quite different to the other sensor data collected on REAMIT. He would like to prepare a powerpoint to explain the type of data he is generating, how it is pre-processed, processed, and analysed. Analysing Raman data is not an easy task.
- **Action: Omar to make a 10-15 minute presentation giving a pilot overview at the next sub-group meeting, and a slightly longer, more detailed presentation at the next WPT2 meeting.**
- Kate asked if UoN would make a final decision on whether to rent a truck or collaborate with Routhiau in October. Omar confirmed that they would, as they need to test the last stage one way or another to achieve the end goal of the project.

#### **HMF, UK**

- Meeting with HMF was scheduled to take place on 23<sup>rd</sup> September, but Natalie was unable to join. Kate tried to reorganise the meeting for this week but Daniel Kelly was unable to attend due to teaching

commitments. Another doodle was sent for next week, but Natalie emailed to inform that she has limited availability at the moment and may not be able to join.

- Natalie provided a response to each of the items raised from Friday's meeting.
- **Action: Kate to communicate to Natalie that from the point of view of data analytics it is important to interpret milk bag status (open/close) on the dashboard. Marco has already this implemented.**
- James' biggest concern is finding out why the binary sensors are not behaving as planned. He believes either the drivers are not installing them (as they need velcro'd each time) and are leaving them at the bottom of the bag, OR that the Velcro is not robust enough and the sensors are falling down during transport / the Velcro has peeled off. **Action: James to arrange a call with Mike from HMF to quickly resolve what the issue is. Having the bag status accurately logged will help immensely with the data analysis.**
- There is one sensor which does not log temperature or humidity at the minute. **Action: James to organise a call with Mike to have a look at this together. A facetime should suffice.**
- James confirmed that Daniel's calendar appears to be free next Monday. James suggested that perhaps Mike could attend the call if Natalie is unavailable.
- Kate has sent Yan's survey on IoT sensors to Natalie, but has not yet received a response.

#### Yumchop, UK

- No updates about the installation of the sensors in the vending machines.
- No reply from Abi to Yan's survey on IoT sensors.

#### Burns Farm Meats, Ireland

- Xavier has been working with Rosanna at Whysor on the dashboard for Burns Meats. He has created two separate dashboards, one for the large room and one for the small room. Each sensor has 2 graphs and 2 gauges. The graphs are a historical temperature plot, and a historical humidity and air pressure plot so that the change over a period of time (8 hours) can be observed. The gauges display the temperature and battery level of each sensor in real time. Cathal has been granted permission to access the dashboard.
- Xavier is still researching alerting temperature - Food safety Ireland said that the storage of meat shouldn't be above 7 degrees C. **Action: Xavier to check with Cathal the appropriate temperature for alerting.**
- On Mondays, they are in and out of the chill rooms often so temperatures are noted higher on these days.
- Pilot officially launched on 7th of Sept 2022, so has been running for 3 weeks exactly. Will have to look at the data which has been recorded soon. James asked if they are recording hind quarter weight before and after the chill, so a mapping could be performed for weight loss on location in chill room. This would also give us a metric for food waste reduction. **Action: Xavier to check with Cathal if they weigh hind quarters before and after dry ageing.**
- James has code he can share with Xavier to show a 3D surface plot of the temperature in the dry ageing chamber as a function of time. This plot could also be used to show humidity. Tamiris asked about the discrepancy in humidity values. James said that these sensors are likely to only be accurate to +-3-5% RH. Alternatively, it could be that different areas in the room have different humidity's, based on the proximity to the fridge unit. Using the 3D plot should help clarify this.

### **Musgrave, UK**

- James finally made contact with Keith on 22<sup>nd</sup> September. Keith told James that one van has been returned to the hire company and the logger removed.
- The van which had been logging unexpectedly high temperature values over the summer was due to the engine being rebuilt. The fridge was not running during the repair.
- This van is now back in the fleet, meaning 2 vans were working with REAMIT technology.
- James visited Musgrave on the evening of 22<sup>nd</sup> September and installed the 3rd sensor into a new van. Now 3 working vans have sensors.
- James still has two sensors to deploy in the other two vans. These vans were off the road for servicing but should be coming back in the next week. James now has a new contact in Musgrave, Sara, who is the afternoon / evening logistics manager. He will work with her going forward to organise the install of the remaining sensors.

### **WD Meats, UK**

- James Dooley is off until September 26th, but he sent some results from his lab scientists before the annual leave. During the week, James was in touch with one of the scientists (Caroline) about the results she got from the Clostridium trials at Ulster versus WD Meats.
- James Dooley had anonymised the Clostridium samples from WD Meats, and the lab scientist didn't know the key James had used to encrypt it. James Dooley had prepared 10 different samples for WD Meats to run at different concentrations, and he was going to run the exact same experiment at both locations. Caroline only received 3 samples, which James G suspects was to validate that the qPCR research machine at Ulster could detect clostridium using the mastermix kit that had been ordered. Caroline has not yet received the 10 calibration samples to confirm if Ulster can repeat the same results as WD Meats.
- Caroline is also engaged in improving the calibration of the WD Meats machine.
- No updates about the dry ageing. James will send Marc an e-mail to check the dry ageing progress, show some preliminary Clostridium results, and request that the survey be completed.

### **3D Fluorescence trial, UK**

- At the WP T1 meeting on 26<sup>th</sup> September, James mentioned the possibility of conducting FreshDetect research via Tahmina and her MSc students / Jipsy this semester. James checked with Tahmina over email after the WP T1 meeting to check if this was possible
- Tahmina confirmed that Jipsy would be employed for primarily paper writing and not FreshDetect research. Tahmina did not commit to any MSc research and reminded that FreshDetect research is not the responsibility of University of Bedfordshire.
- James will have a casual conversation with Tahmina in person next week in Nantes to see if there is any scope for MSc project work.

### **WPT2**

- **Action Sahar: Contact Andrew regarding the Big Data Server being offline. Joy to work with Sahar.**
- Sahar remembers data being up to date as of 14<sup>th</sup> of this month.



- Sahar has sent a doodle poll to WP T2 partners to organise the next meeting. The options run from 3<sup>rd</sup> October to 17<sup>th</sup>. She is still waiting for responses before setting a suitable time.
- Sahar has sent an email to Imke and Ram about receiving access to the dashboard. Kate advised Sahar to contact Rosana instead. **Action. Sahar to email Rosana for dashboard access.**
- Ram had mentioned that Ali and Omar should be involved in WP T2 meetings going forward. Ali told Sahar that he may not be able to attend the meeting, but that Omar would join.
- Kate discussed with Ram about focusing on one pilot test at a time, given the little time left in the project, and obtaining deep data around this pilot to do more meaningful data analytics, and thinks he agreed with her point. HMF is likely to yield the most interesting results. Yumchop has stable data flowing, but Yan highlighted that it might not be that interesting to apply analytics to since these sensors are stationary. James pointed out that Picnic has the scope for very interesting analytics, but more effort is required here since we need to request specific data exports to receive their files. We would also need to wait for sensors to be installed at picnic again for this analysis to really take off.
- Ram has conducted some mathematical modelling for the Picnic problem already, supported by Usha. Sahar is going to think of further ideas to improve Rams model. **Action: Sahar to investigate further developing Ram's model.**
- Davinder's replied to Kate's email about the app. It is still his intention to produce two apps. He does not think it is convenient to get it published in the play store due to GDPR requirements.
- One of Davinder's main concern is that Bedfordshire VPN wouldn't be functional outside of business hours (9:00 to 5:00 PM). Joy confirmed that she has previously not been able to use it after 5pm. **Action Sahar: Contact Andrew about the VPN opening hours.**
- Joy had noticed that the last update from Picnic sensors was around February. She asked James if he knew anything. James confirmed that the original 20 sensors installed by Whysor all got destroyed as the casing was not robust enough to withstand impact from groceries. Whysor has prepared 3d printed casing and have another 10 sensors prepared and ready to deploy. It is their intention to do this shortly.
- Joy suggested a Metadata document be constructed for each pilot so that any partner wanting to analyse the data can understand what to expect in the data. Knowing that Picnic stopped recording data in February for example would be useful.
- James said he had constructed both a high-level spreadsheet as well as a word document detailing each pilot around November 2021. At the time of creation, there did not seem to be any feedback from partners finding it useful or much traction on adding to this documentation, so James did not pursue it any further. James is happy to resume this work with the help of other partners if there is an interest in it existing. **Action. James to update and resend documentation produced last year for meta-data/ analytics for HMF. Team to develop these further for other pilot tests. Kate to make metadata folder on Sharepoint.**
- James received JavaScript files from Marco to aid with the real-time synchronisation between the Whysor cloud and the Big Data Server. The file had initially been sent in August but had been blocked by James' University mail server. James intends to have a look at this piece of work in the next month.

### WPT3

- Tamiris has been working on the Yumchop paper and on the tool to estimate the impacts for the food companies to include in this paper.

- This tool / framework is able to estimate the performance of the cold supply chains, not just Yumchop. Tamiris plans to showcase the tool at tomorrow's WP T3 meeting.
- The database still needs updated so that the tool can be applied to other companies, not just Yumchop. Tamiris believes it will be useful for companies in the future to estimate their own carbon footprint impacts themselves. For example, if they wanted to change some ingredients in the foods, how would their carbon footprint be affected?
- The next steps are to create a tutorial video to explain how to use this tool, when and how to understand the results.
- Tamiris has sent an email to Natalie about the literature last week, but she hasn't replied yet. For now, she is using the percentages from the last email. If Natalie is not happy with the new results, Tamiris is considering changing the analysis to just include the amount of milk that we should avoid to compensate the impact we are already adding to the system. This would mean we would lose some results like the amount of CO2 being saved by the project.
- The mapping business and technical landscape review paper has been completed last week and sent to Ram for feedback. Improvements to the paper are now underway based on this.
- Tamiris is also working on the results for Burns Farm Meats and is planning on sending this to Xavier.
- She is waiting on receiving confirmation from Marc at WD meats for some values to be used in the LCA for WD Meats. Tamiris will keep the estimates she's already made if no contact is made.
- **Action: Kate to contact Natalie about the literature that Tamiris has requested.**
- **Action: Kate to complete the introduction for the life cycle assessment of Yumchop paper.**
- Yan has approved the survey email template which Kate prepared. Yan and Ram suggest that one person follow up with a telephone conversation with the 3 or 4 pilot companies to collect feedback on questionnaire. Kate has yet to receive feedback from either Yumchop or HMF on the survey. **Action: Kate to check with Yan and Ram what companies the survey should be tested on. Action. Kate to send email template to James.**
- James to host WPT3 meeting tomorrow (29/9)

## WP C

- The date for the REAMIT symposium in Nantes has been set as 8<sup>th</sup> December 2022.
- The September newsletter has been released and its main focus is advertising the REAMIT Symposium in Nantes. Also included are new posters for Biogros and Musgrave. Sasha encouraged sharing the newsletter on each partner's social media channels.
- Sasha requested an update on Burns Farm Meats. This, and an updated poster on Picnic, are the only remaining ones to produce. Imke is going to work on the revised Picnic poster. Xavier and James will complete the Burns meat poster. Xavier thinks he could have this finished for the end of this week. **Action: Xavier to complete Burns Farms Meat poster and send to Sasha.**
- Sasha asked if everyone could exchange contact details with Omar, who is leading on the trip to Nantes next week (October 7<sup>th</sup> 2022). Omar has sent information with transport links etc. to all partners attending the visit.
- Regarding the documentary's progress, Rich is joining on the trip to Nantes to capture interviews with UoN and Valorial team. Ulster still have to provide their input, which shall be arranged between James and Joan. They will each visit Rich's studio for this.



- Sasha is going to approach Notts TV to discuss screening the documentary. Sasha encouraged each of the partners to investigate their own local TV stations and see if getting broadcast slots for the documentary was an option. It is also okay if the station is online only.

## **WP M**

- Kate is still finalising the REAMIT project progress report 4.1, asking different partners for different inputs, like evidence for the auditor, because partners usually do not upload materials, e.g. presentations in the eMs.
- BED are yet to agree on a new date for their on-the-spot audit.
- BED are in the process of employing a new visiting staff member, Paula Borowska, who will help with admin tasks like contracts, timesheets, etc. She should be joining in the next week or two.
- Ram is giving a presentation on grant applications at the University of Essex on 5<sup>th</sup> October 2022. He has asked Kate and Yan for contributions to the presentation. Yan and Kate will co-present at the meeting.
- Ram and Kate are attending Funders Live London event on 5<sup>th</sup> October 2022. It is a free event open to anybody looking for funding for their new companies. This may help Ram's spinout company venture.
- Kate has been working on her input for a number of REAMIT inspired publications.

**Next meeting: 12 October 2022, 11 am.**

## **REAMIT sub-group meeting, 12/10/2022**

Attended by Katarzyna Pelc, Sahar Ahmadzadeh, Gautam Samriya, Joy Eze, Tamiris da Costa, James Gillespie, Xavier Cama, Sasha Bennett, Omar Dib and Paula Borowska

Kate introduced Paula Borowska to the group. She is from sociology background and is a visiting staff member at UoB and will be supporting the administrative tasks of Kate. Welcome, Paula! Paula introduced herself to the group and every group member introduced himself/herself to Paula.

Kate informed that Paula was recruited as Kate is reducing her work in the project to focus more on the research work in the project and to support Ram for closing the project. Kate also updated that from now on Tamiris would organise the subgroup meetings and send biweekly invitations.

## **WP T2**

### **Presentation by Omar on Raman Spectroscopy pilot test at UoN and its data analysis.**

- Omar presented an overview of Raman Spectroscopy pilot test at UoN in France and its data analysis. He demonstrated how they treat the data in their lab, how they convert the raw data and the steps involved in its pre-processing before the analysis.

- The Raman spectroscopy generates the raw data. The first step of pre-processing is to remove unwanted signals, the second step is baseline correction, third step is smoothing and the fourth step is normalisation. After these processes, they get the treated data and analyse it using visual tools/advanced geometric tools/statistical tools like PCA, ICA and other models.
- As raw data, the Raman Spectroscopy generates a file. The files have about 10 kilo bytes in size. The file is then converted by their own script in Matlab to data matrix or to an Excel sheet. There are two columns in the output: 1st-the Raman shift, and 2<sup>nd</sup>-the intensity. Each file has 1044 data points.
- UoN did 100 Spectra per day for 30 days, which represents a total of 3000 files, each file containing 1044 data points.
- At first, Omar plots the raw Raman Spectra to have an overview of the signal and to see if the signal can be corrected. Then the Raman data is pre-treated to remove unwanted signals. The second step is to do baseline correction to shift the signal towards the X axis. This step is very important because the Raman spectroscopy can have interferences, such as fluorescence or the molecules present in the food. Therefore, Omar removed all unwanted interferences in order to get the Original Raman Spectra of the food sample.
- In the smoothing step, the noise components are removed. In the normalisation, the over data is regularised with respect to the variation present in the sample. As example, what they did was to take the average from 5 days, 10 days, until 30 days. In the example shown, with normalisation the intensity scale is changed and the highest peak is smaller, which facilitates the comparison between the signals.
- Omar showed the visual tools and the peaks produced from Raman He explained that there is a difference between the area under the curve for signals of different days, due to difference in quality of chicken. The area under the curve is calculated for each day. Geometric tools or advance statistical tools such as PCA can be also used. PCA try to differentiate the sample based on the variability present in the data. PCA gives the information on the peak responsible for the differentiation between the first and last day of spectra.
- Omar asked how to proceed with the analytical part with REAMIT partners because the data that UoN have is different than temperature sensors and much more complex. He is concerned on how to send the data, if it needs to be treated before sending to the partners or if the analytical partners will be able to handle this job?
- Kate thanked Omar for the presentation and asked analytic partners for their inputs.

#### Q&A

- Tamiris- The difference between the first day and the last day is just of analysis is the intensity of the peaks, but the composition of the chicken does not change, correct?
- Omar- The composition is changing. The intensity is changing from day-five to day- 30. The peaks are lowering, which means that the protein inside the chicken is breaking down. This can be used as an indicator that the quality is changing. It is possible to link this protein breaking with quality, to give a quantitative data, but for that UoN have to do another model, another laboratory testing where they need to check the concentration of protein in the lab and link it with Raman. It needs a lot of work in the lab and it would need an extension of current work.
- Gautam- How do you think the analytics team at REAMIT can help you best, at what stage in your work? For e.g., creating a pipeline for pre-treatment, using automation scripts, or helping with visualisation, etc.? What do you suggest as the best way to support you?
- Omar- I think we need help with how to alert the driver or unskilled labour who's testing, at the end, without showing these complicated figures.
- James- It's going to be complicated to reduce everything that you're doing down to an alert to the driver. Which one of the visualisations you think is most important to quantify?

- Omar – For us, it's PCA. To simplify your job we can send the final result and not all the data from the beginning. If you want to quantify this only.
- James -I guess that should be doable because the plots are based on raw data.
- Tamiris - Omar, can you identify the chemical composition of the samples that you are analysing?
- Omar - Yes, of course. The Raman spectroscopy targets the molecules present in the sample. There is a library with which we can identify each peak corresponds to which chemical (acid, protein, amino acids, etc.) using the Raman shift.
- Xavier – If we put a fresh chicken in the test and compare it with the existing chicken, can we say how fresh the existing chicken sample is by comparing?
- Omar- Yes, we can tell qualitatively.
- Tamiris – Is it possible to determine the quality based on the difference between the total area under the curve for all the peaks?
- Omar- The area under the curve gives more of a qualitative perspective rather than a quantitative perspective.
- James - Can we link the intensity based on findings in the literature to what the protein content may be at that intensity without performing experiment ourselves?
- Omar - It depends on the product we are using. It is different if it is meat beef, chicken, etc.
- Xavier - But for REAMIT, it is more interesting the qualitative analysis because in a truck you are not going to determine the concentration of a protein, the exact amount.
- Omar- Yes, we just need a generic result – whether the sample is deteriorating or good.
- Gautam - Is there any way we can link this the value of the intensity to protein concentration based on any theory or literature?
- Omar - I don't know. No, we cannot do that based on literature now. It's difficult.
- Gautam - Do we have threshold values for these intensities, for example, if it goes below 0.5 then we say the chicken is acceptable quality?
- Omar - No, it's not possible because it's not a specific unit. For example, 0.5 is not 10 milligram per gram of protein. So, it's very difficult unless you have a model for that, which takes time.
- Kate thanked Omar and the partners for all the questions and clarifications. Kate and Omar discuss to have this presentation in WP T2 meeting as well to get more ideas from the wider audience. **Action. Omar to present it in WP T2 as well.**

## WPT2 further updates

- BED server is again going offline intermittently.
- Sahar contacted Andrew earlier about the server getting offline. Andrew did a reset, and the server went back online. However, the issue still occurs intermittently.
- Sahar updated it could be because of some tests by ICT in the network.
- Joy mentioned that Server access is stopping intermittently because another needless service is running in the server and is causing access to data server getting blocked. **Action. Joy to look into the server issue, and have another service running, to fix the server issue.**
- Sahar received an email from Imke about accessing the dashboard, although Sahar has not tried accessing dashboard yet. **Action. Sahar to try dashboard access.**
- Sahar had mentioned that she will further look into the mathematical model proposed by Ram for Picnic ice usage problem. Sahar could not look further into it after the initial mail. **Action. Sahar to look the mathematical model proposed by Ram.**

- Sahar has been working on some publication. Sahar couldn't discuss with Andrew about the VPN opening hours. **Action. Sahar to discuss with Andrew on VPN opening hours before going on her leave.**
- Sahar would send an updated doodle poll to WP T2 partners to organise the next meeting. The options run from October 17<sup>th</sup> to 19<sup>th</sup>, as some partners are going on leave in the last week of October.
- James sent an updated Metadata document with analytics for pilot tests at HMF. It has also been updated with Musgrave and Burns Farm Meats details. Metadata folder has been created on Sharepoint by Xavier.
- Kate asked Joy how Joy would use this document. Joy replied that this document will be helpful to understand the pilot test problem and guide the analysis. **Action. Kate to update Yumchop details in this document.**

## WPT1 Pilot Tests

### Raman Spectroscopy, France

#### HMF, UK

- Kate updated that a meeting with HMF on data analytics could not happen.
- Natalie responded that she prefers that we communicate with Mike directly about sensors.
- James could not have a call with Mike from HMF.
- **Action: James to message Mike and try to set up a call with him in the next 1-2 weeks.**
- Tamiris did not get a reply from Natalie on literature review.

#### Yumchop, UK

- No further updates.

#### Burns Farm Meats, Ireland

- Xavier is planning to have a meeting with Cathal hopefully next week.
- **Action: Xavier to check with Cathal the appropriate temperature for alerting.**
- **Action: Xavier to check with Cathal if they weigh hind quarters before and after dry ageing.**

#### Musgrave, UK

- No further updates.

#### WD Meats, UK

- No further updates.

#### 3D Fluorescence trial, UK

- No further updates.

## WP M

- A new visiting staff member, Paula Borowska, will help with admin tasks like contracts, timesheets, etc. joined the UoB.

- Kate gave a seminar on proposal writing together with RAM and Yan on the 5th of October. It was an online event at the University of Essex, and over 40 people attended. It was a very interactive and interesting session with many interactions with the audience.
- RAM won a grant of £8000 at a competition at University of Essex for further developing his spin-off idea. He pitched his spin-off idea to the investors, and they offered him a grant to develop it further. He needs to specify now how the £8000 will be spent.
- Kate thanked UoN colleagues Ali, Gerald and Omar for hosting the REAMIT team at UoN in the previous week and for their hospitality.
- Kate thanked Omar for his presentation today.

Kate makes Tamiris host of the meeting.

### WPT3

- Tamiris updated about her data collection activity at UoN for the LCA for Raman spectroscopy pilot test. Tamiris updated that unlike sensors at other pilot tests, where she collects data about raw materials used for sensors, here she is just focusing on electricity consumption and usage as the sensor is different.
- Tamiris thanked Omar and UoN team for their help and planned to get more information during the planned visit for Symposium in December. Tamiris requested Omar to send her the equipment specifications for the pilot test. **Action. Omar to send equipment specifications to Tamiris for Raman pilot test.**
- Tamiris has been finalizing the revision for HMF paper. She had to change some figures due to changes in data of electricity consumption and the use of polyethylene bottles.  
 Polyethylene bottles are used just once, and then HMF sent it for recycling, which is not a sustainable practice. Due to this, the results changed, especially the impacts for climate change, for example, almost doubled.
- For WD meats, James sent Tamiris the correct amount of meat per chamber before and after the ageing process, so Tamiris can refine the results. Tamiris still needs to find a way to determine the amount of food waste avoided and is awaiting input from James. **Action. James to Marc and would confirm Tamiris about food waste avoidance data.**
- For Burns Farm Meats, Tamiris updated that she has modelled the inputs based on data collected during her visit to BFM. However, she needs data on average monthly electricity consumption at BFM and then she plans to send the result to Xavier. **Action. Xavier to get this data from Burns Farm Meats and share it with Tamiris.**
- Tamiris showcased her framework tool at WPT3 meeting and sent the completed excel from the calculations of CO2 emissions to Ram. Although she tried to make it user-friendly, there are too many characterizations factors that increase complexity in understandability.
- The mapping business and technical landscape review paper has been sent to Ram. Tamiris updated that Ram is also planning a framework paper outlining calculations based on the carbon emissions of each pilot. Tamiris needs to finalise it in one month.
- Qualitative study: James updated that there is a planned meeting this afternoon to be attended by Ram, Trevor, Alien, Joan, James and possibly others to discuss the scope of the qualitative study. Ram wants Ulster to lead this.
- Quantitative study: James updated that he is not sure of the exact status on this, but he saw an email that the survey returned to Yan with a quote of £3500. Kate has yet to receive feedback from either Yumchop or HMF on the survey. James sent the survey email to Robert Gallagher at Musgrave, but he got

an out-of-office reply and did not receive any feedback. James is not sure if we received feedback from HMF and Yumchop as well.

- Yan had wanted to gather from at least two or three pilot companies to make sure that the survey had made sense before we distribute it to 250 companies.
- We have the quote and we can proceed with the survey promotion. It is expected to take around 2 weeks from survey distribution to having the responses. As WP T3 deliverable, James believe we can still progress on that if we can collect this data by December or by the end of October and have time to write.
- 

## WP C

- The September newsletter has been released and published on REAMIT website and social media. Sasha encouraged sharing the newsletter on each partner's social media channels.
- Aside from the newsletter, the website has been updated as well. A new feature for the symposium has been added on the home page, that leads directly to the registration link. A couple newer features, which act like a shortcut link to previous newsletters and the most recent newsletters has also been added to the homepage.
- Tamiris and Sasha discussed if it would be a good idea to invite Memona for the next meeting, to explain her plans for the symposium. Sasha suggested that subgroup members may request to join the next Symposium meeting of 20<sup>th</sup> October. James suggested we can invite Memona to the subgroup meeting and move the communication section to the beginning. **Action. Tamiris to invite Memona to the next subgroup meeting to update about the Symposium's agenda and planning.**
- Sasha also focuses on pushing the Symposium promotion on social media and local networks. Sasha encouraged everyone to promote the Symposium event on each partner's social media channels, especially colleagues at UoN in France. **Action. Omar to try to promote it on UoN website and social media.**
- Sasha is also working on developing a REAMIT journey timeline on website. It's an interactive slide deck that shows the beginning of the REAMIT project from when it started until now, and highlights some key moments throughout the journey. It's embedded on the website, but the page is set to private at the moment as it's still being edited. Once ready, it will be a feature on the website. The users will see key highlight events in REAMIT journey as they scroll down through the timeline deck. It's in interactive mode.
- Sasha gave a presentation of the timeline to the subgroup. The timeline is being prepared for the legacy of the REAMIT project. Once the project has ended, this will feature on the homepage for people to see the REAMIT journey.
- The group liked the timeline idea and gave Sasha some suggestions. For e.g., to update the Raman Spectroscopy picture, explore adding more events or details to timeline, such as visit details, conference details and pilot test details.
- Regarding the documentary's progress, Rich has filmed videos during the trip to Nantes for the documentary. James will be communicating with Rich and Joan to film their section of the documentary. Sasha and Rich will edit and get the documentary ready in the next couple of months (before the Symposium) and start distributing it to some broadcast media.
- Sasha is trying to get to a local channel in Nottingham, but it seems to be difficult, otherwise, it will have to be broadcasted online. Sasha also requested partners if they knew of any local media channels, to let her know and then maybe she can contact them to broadcast the documentary.
- Sasha asked if someone could write an article on the visit to UoN. Sasha requested Omar to include a paragraph on visitors at UoN in the article he is writing on the role of Raman Spectroscopy in advancing

**REAMIT. Action. Omar to write an article on REAMIT visit to UoN and the role of RAMAN Spectroscopy in advancing REAMIT.**

**Next meeting: 25<sup>th</sup> October 2022, 11 AM.**

## **REAMIT sub-group meeting, 25/10/2022**

Attended by Katarzyna Pelc, Gautam Samriya, Tamíris da Costa, James Gillespie, Xavier Cama, Sasha Bennett, and Paula Borowska, Sahar Ahmadzadeh

### **WPT1 Pilot Tests**

#### **Raman Spectroscopy, France**

- No further updates.

#### **HMF, UK**

- No further updates. Kate is on leave until 27<sup>th</sup> October and from Sahar off from tomorrow until 28<sup>th</sup>.

#### **Yumchop, UK**

- No further updates.

#### **Burns Farm Meats, Ireland**

Xavier is due to meet with Cathal Burns tomorrow for an update on the alerting system and to discuss preliminary assessment of the results, and electricity consumption for LCA, REAMIT poster and communication materials.

- Xavier suggests they want to propose the study of stream-loss and weight-loss of the meat, due to the dark colour of the meat caused by explore to the environment.

#### **Musgrave, UK**

- One of Musgrave's contacts, Andy Keery Refrigeration is interested in trialling REAMIT technology. UU are now considering launching a new pilot with Andy Keery Refrigeration. They have been in contact with James about this trial. James proposed to use a Digital Matter sensor he had previously prepared for Musgrave for use on this new trial with Andy Keery Refrigeration.



- At Andy Keery Refrigeration, they have a cold storage for fruit and veg, milk and beef products, flowers and wine. James suggested we could trial the sensors with the flowers and wine as a proof-of-concept trial as Ram has suggested. This could be relating to the business case for WPT3.

#### **WD Meats, UK**

- No further updates.
- James emailed James Dooley to get an update on the clostridium and prepare the technical report, but no reply received. There's an issue with the clostridium detection from the machine so this will need to be resolved.

#### **3D Fluorescence trial, UK**

- No further updates.

#### **WPT2**

- There was an issue with connectivity to the remote desktop connection.
- There was a meeting between Sahar, James, Gautam and Joy attended a meeting for WPT2 yesterday.
- Sahar had sent several emails to Andrew, but this issue has now been resolved.
- James explained that Sahar had an issue with exporting the HMF data set and had noticed that there was no data existing from August – mid October. During this period, they had the VPN issue so Whysor couldn't connect and upload the data themselves. Whysor was sending the data files weekly to Joy. Joy could not log into the server to execute these files due to an IP address duplication.
- Since Thursday last week, James said the IP address issue had been resolved. He has since managed to install the asus management suite utility to assign a new IP address. Since this, the server has been working fine. Marco has since logged in and uploading data, but the backdated data hasn't been uploaded as Marco was assuming it was being uploaded. We now have only 2 weeks of data inputted into the server.
- This afternoon, Sahar has a meeting with Gautam to work on the table indexing.
- Gautam said they are using a combination of device name and time stamp for a primary key.
- Gautam advised there has been a problem when they connected to the server, there were duplicate records to be removed, but they had not established a stable connection in order to successfully remove the duplicates.
- **Action: James requesting for Gautam to keep him up to date with this indexing process** as he has a colleague who is a specialist in data administration that can advise on this.
- James suggested the database is indexed properly; it will be able to retrieve the records quicker.
- The next WPT2 meeting will be held on 24<sup>th</sup> November 2022.
- Tamiris asked Sahar if she has checked the mathematical models sent by Ram. Sahar said she had discussed some ideas with Ram, but nothing in depth as yet, so this is in progress.
- Systems requirement document: James advised missing information for Picnic, Yumchop, WD Meats. Only update so far since the last meeting came from Xavier on Burns Farm Meats. James has written up



a brief update from Biogros. James is happy to document information for Picnic but suggested someone from BED could prepare information for Yumchop data and what analytics to be performed.

## WP M

- Kate emailed Tamiris, with a request for Gautam to send notes on WPT3 to Kate and Paula to finalise the minutes from the RAC Meeting. Gautam said he will send today, end of the day.
- Kate sent details of a forum event by Interreg North-West Europe, the NWE Project Ideas Forum at CCD Congress Centre Düsseldorf (Germany) on 29 November 2022. <https://www.nweurope.eu/news-events/events/registrations-now-open-for-the-nwe-project-ideas-forum/>
- Tamiris announced UCD will be hosting the upcoming RAC meeting in January 2023. Xavier had sent an email to partners with an excel sheet for partners to indicate their attendance, by next week, 4<sup>th</sup> November.
- Xavier says so far, they've been looking at possible rooms to host the meetings at UCD. These will day place or 1 and a half days. The team would like to consider including other activities such as dinner with the whole consortium on day 1. Partners can indicate which activities they'd like to participate in.
- 1 option for Day 2 activities would be to go visit Burns Farm Meats but this plan is not feasible as they are located 3 hours away from Dublin. Xavier has suggested to visit the Guinness factories in Dublin as they offer tours to the public. They contact Guinness to find out if it's possible to provide a tailored tour, with more information pertaining to the work of REAMIT.

**Action for all: Partners will have to indicate their interest in this visit to the Guinness factory in the spreadsheet.**

## WPT3

- Tamiris has been working on the LCA to estimate the amount of environmental impact for food companies. Tamiris will be sending the LCA tool and requesting feedback from partners, e.g. is it user-friendly? Tamiris demonstrated how to use the LCA tool spreadsheet and the various input factors, such as raw materials, energy consumption etc. Tamiris will try and summarise some of the specifications.
- **Action: Tamiris to send to partners for feedback on layout and useability.**

## WP C

### **Plans for REAMIT Symposium**

- Sasha has advised she is working with Mémona at Valorial on some communication materials for the Symposium, a new email signature and banner for the event. Partners are encouraged to update their email signature with the details of the Symposium.
- A banner, email signature and LinkedIn post will be published.
- Tamiris asked, how many sign-ups/registrations did we receive? Sasha advised not many, around 20 so far and majority were REAMIT Partners.
- James asked if the event was available on Eventbrite? Sasha advised yes – sent link to Eventbrite to the chat.
- Sasha advised that there is a questionnaire for partners to indicate which of the days and activities they will participate in. Partners will need to complete this questionnaire asap.
- Tamiris read an email from Mémona. Valorial would like to have someone from the European commission speak at the Symposium. She has asked if we have any contacts, we should let her know.
- In the morning of the Symposium there will be some project results delivered in presentation by REAMIT Partners.
- In the afternoon, there will be 2 roundtables lasting one hour, and will be facilitated by a moderator. The name of the moderator will be revealed in the next meeting. Mémona will present further info in the next meeting.
- On the 9<sup>th</sup> of December, there will be company visits in Nantes, and there will be further details on this during the next meeting.
- James suggested for the team at University of Nantes to promote the Symposium. Sasha advised she had already spoken with Omar at UON about promoting the Symposium locally, they advised they will send a LinkedIn post. Sasha suggested a LinkedIn post alone isn't sufficient so we will work with Valorial to produce a campaign email to send out to partners to share with their networks.
- Tamiris asks will the presentations be in English? Sasha advised, there will be translation services available in both French and English.
- Sasha also emphasised the point that it is important for partners to attend in person, rather than simply watching online.
- Tamiris asks who from the sub-group will attend. All have indicated they will attend in person, but Sahar has raised that it is difficult to apply for the visa. Sasha says it will take some time to sort the visa, so it's best to start from now. Sahar is in touch with the international office at University of Bedfordshire. Gautam advised he has an appointment to sort his visa in Dublin's embassy of France so it he will be fine to attend the Symposium. Sasha and Gautam provided details of French visa application requirements to Sahar.

### **Website**

- Sasha advised there are plans to transfer the REAMIT website over from Squarespace to a new supplier, GoDaddy, so Sasha is working on this with the procurement team at NTU. GoDaddy is significantly cheaper than Squarespace which would indicate that it has fewer complex features, but Sasha will explore if this affects the visual aspect and functionality of the REAMIT website.

- Sasha has advised that she has exported web file from the old REAMIT website on Squarespace, to upload to the new site once the subscription has been paid.
- Sasha advised to Tamiris, the website layout will remain the same, the only difference is, the host of the website will remain until 2026, after the project has ended. Squarespace only has 1-year subscriptions, whereas the subscription model on GoDaddy allows you to pay for multiple years at once. Sasha is waiting for confirmation the NTU procurement to go ahead with this payment but is taking a while for procurement to approve of this.

#### **Posters**

- A poster for Picnic and Burns Farm Meats are currently in progress. This is with the help of Xavier and Imke.
- All other project posters have been completed.
- Biogros poster has recently been uploaded on the REAMIT website.
- Picnic poster- James is working on the system architecture diagram for Picnic. James advised he'd been liaising with Imke before the end of this week.
- Tamiris asked if there will be a poster prepared for the upcoming RAC at UCD in January, Sasha advised there won't be any but existing posters and a roll-up banner at UCD will be displayed.
- Sasha reminded Tamiris that it is a requirement for partners to have their roll-up banners available and on display. Tamiris will check if they have a banner in the UCD office, in time for the meetings in January 2023.

**Next meeting: Thursday, 10<sup>th</sup> November 2022, at 11am.**

## **REAMIT sub-group meeting, 16/11/2022**

Attended by Tamiris da Costa, Gautam Samriya, James Gillespie, Xavier Cama, Sasha Bennett, Omar Dib, Mémona Dalichampt, and Paula Borowska.

### **REAMIT Symposium in Nantes**

Mémona attended the first part of the meeting and provided an overview and updates on the upcoming REAMIT symposium with presentation title: "global update symposium".

- The symposium is going to take place on the 8<sup>th</sup> of December 2022 in the Chamber of Commerce and Industry.
- On the 9<sup>th</sup> of December, there are company site visits scheduled for the REAMIT team.
- Documents with travel information had already been sent to partners.

#### Morning session – 8<sup>th</sup> of December

- There will be 2 hours dedicated to the REAMIT project exclusively.
- Several actions are required by partners before the 25<sup>th</sup> of November.
  - Prepare a PowerPoint presentation using template sent by Sasha.

- Fill in table with job position/function.
- Fill in sheet asking for permission to record.
- Sandrine Amsler, European Commission, will give a presentation.
  - Sandrine joined the EC directorate-general for health and food safety in Nov 2021.
  - She works in the Farm to fork unit responsible for EU programmes implementation.
  - She has been a national expert on animal feed in France for more than 10 years.
  - She will give a 15 min presentation followed by Q&A.
  - The moderator will be Pierre Christen, an editorial consultant and freelance journalist and expert in the food industry.

#### Afternoon session – 8<sup>th</sup> of December

- 2 round tables: 5 speakers, 8 minutes per speaker with Q&A.
- Discussions will be in French with translation in English enabled.
- Confirmed speakers: UpCyclink, Handi-Gaspi, Sensostat, Simone & Co.

#### 9th of December

- Company site visits (MiN and tbc)
- 10:15 to 15:00 including lunch break.

#### Other info and questions to Mémona

- The symposium will be filmed and broadcasted.
- There will be an area with high tables and stands for exhibition.
- They will send an email to 5000 contacts in French.
- They will also prepare an email in English for the same purpose.
- Mémona will send a reminder to partners to provide all the information/PowerPoint presentations.
- James asked about having the REAMIT posters on the exhibit. Sasha and Mémona may talk further off-line, but it seems there should be no issue –Mémona needs to make sure they have a budget for printing the posters in large format.

## **WPT1 Pilot Tests**

### **Raman Spectroscopy, France**

- Omar informed that they contacted Rothiau. No reply was received yet, so they will most likely opt for the plan B: they will rent a truck – specialised for food transportation - and install the Raman device. If they do not receive an answer in the following weeks they will go ahead with plan B.
- They have been working on the article for the special issue. It was in the last phase, they need to send it to Ram for approval.

### **HMF, UK**

- No updates available.

### **Yumchop, UK**

- No updates available.

### **Burns Farm Meats, Ireland**

- No meeting had been conducted with the company. Cathal Burns had a small accident at work and the meeting that was supposed to happen has been delayed. Xavier wanted to talk to him about trim loss analysis, weight loss, communication materials – poster, conference presentation; LCA, alerting system, among others.
- Xavier was confident that talks with Cathal will be resumed in the future.

### **Musgrave, NI**

- One of the loggers has run out of battery – it provided approx. 29000 datapoints, which was a robust battery performance. Replacement batteries have been purchased already, James need to organise a meeting with them and replace them.
- 2 other loggers were prepared – originally intended for two other vans. There were now prospects of deploying 1 of these loggers in another company, one of the contacts of Musgrave:
  - During the Belfast Christmas Continental Market, with the company: Rockets (burgers). They are concerned about the continuity of the cold chain.
  - Pilot will be only for the duration of the Christmas market.
  - James was going to visit the Christmas market that afternoon.
  - There may be the option of other clients in the New Year for similar pilot tests.
  - The logger will be hardwired instead of battery reliant with the help of Andy.

### **WD Meats, NI**

- There has been a lack of communication with James Dooley and WD Meats. There are no news about the machine calibration results even though a site visit was carried out at the beginning of August. James will email Caroline (lab scientist) to ask her if she knows if James Dooley is back and/or about the results.

### **3D Fluorescence trial, NI**

- No updates available.

## **WPT2**

Sahar Ahmadzadeh was on annual leave. Joy provided updates:

- The server seemed to be working optimally most of the times. Sometimes, however, there are issues trying to connect to the server.
- When that happens, partners can always access the data from Whysor's Dashboard.
- Gautam explained that he logs in the BED server and exports data from there directly. Exporting from Whysor's cloud is equally fine.
- One main difference to take into consideration, James explained, is that from the Whysor's Dashboard you have to export sensor data one by one, i.e. if there are 10 sensors, that means 10 exports.
- The best solution for partners to analyse newly acquired data in a convenient manner would be the completion of the API call between servers – James intends on helping on that front but current workload makes it difficult (in progress).

- James explained that it is technically complicated to push data directly from the sensors directly into the BED server.
- James asked about the sub-group T2 meetings as proposed by Ram. T2 partners were assigned a pilot test/s for analysing data (that does not mean strictly that they only have to work on that data). Next T2 group meeting is on the 24<sup>th</sup> of November. So far no T2 sub-group meetings have taken place.

### **WPT3**

- Tamiris explained that she had sent the review paper to the (Sustainability) special issue. She wanted to ask Ram what his approach for the Article Processing Charges (APCs). From previous communications, Ram wanted to ask for a discount on the following papers, at least a 50%.
- Tamiris explained that the LCA papers had also been submitted.
- There was a meeting with HMF that same day to discuss data disclosure as they were concerned about how results could potentially affect their image - Ram, Kate and Usha would also be there.
- Tamiris had updated the LCA tool so that it included transmission technology options to choose from on a drop-down menu. She showed the LCA tool to the group: it was possible to see a graph showing transmission technologies and how they affect the results for all sort of LCA parameters (e.g. water consumption, land use, ionizing radiation, etc).
- James explained that depending on the LoRa sensor, there can be 1 or 2 batteries. The sensors in Burns Farm Meats only have one battery each.
- Gateways also have an impact on electricity consumption, the exception is the Netherlands given that connectivity networks there allow for not having a gateway device.
- Tamiris asked for feedback on the LCA tool, if partners can have a look at it if they did not have a chance yet.
- T3 questionnaire → James informed that 1 of the quotes from one survey company was cheaper than the company Ulster originally had in mind. More quotes were needed to make sure Survation was fine to use.
- The questionnaire is expected to be completed before Christmas. Some delays have occurred as Trevor is currently on sick leave. James wanted to allow some time for him to recover as Trevor is the person who was leading on this.
- Tamiris observed that the group would need to have a meeting at some point to discuss progress of the questionnaire.

### **WP M**

- Paula explained that Kate emailed her about updates:
  - Kate approached the BED contact person at the ministry UK regarding the appointment of an audit company for the extension of the REAMIT period - whether the current company can remain the BED audit company. The update is that they are allowed to use the same audit company.
  - Kate is assisting the team at Essex regarding the organization of the last RAC meeting in March, 2023.
  - Kate is working with BED team and MTU and funder, to see if it is possible to extend Gautam's contact which is expiring in December, 2022.

- Kate will help Paula develop and share the minutes from the RAC July 2022. Deadline: 25<sup>th</sup> of November,
- Kate provided input on two publications (Usha's paper on HMF and Tamíris' paper on LCA at Yumchop).

## WP C

- Sasha had been working together with Mémona on communication materials for the next Symposium. A new poster Symposium image had been published on the website and EvenBrite page. An email signature was provided for partners to update their own in order to promote the symposium. Partners encouraged to promote the event to their contacts. English campaign will be ready by the end of the week.
- REAMIT documentary: Rich had sent most of the videos which will be featured in the documentary. Pilot test videos were completed, only missing some interviews with staff members. The video will be sent to partners when ready for feedback – currently at editing stage.
- James congratulated the work on the documentary, only feedback is regarding the length of the documentary as it could be too long.
- James spoke to Rich, and can talk to Usha as required, and they agreed that an interview with him was not necessary. He already appeared on most clips.
- Trevor can be a face for Ulster University given his involvement in the project.
- The REAMIT doc. was intended to be shown in the exhibition area of the next symposium.
- Sasha explained that she was finding it difficult to find TV stations that could broadcast the REAMIT doc. She had contacted Not TV, but no response was obtained. Finding a TV station that can commit to broadcasting an external 15 min full-time-slot video may be complicated.
  - **ACTION: if partners can think of local TV channels in their region where the documentary can be featured, let Sasha know.**
- James suggested University TV channels as more approachable. As he recalled, Rich had also commented previously that it was not possible that local TV channels as the such of NI BBC spin off could broadcast an externally produced documentary.
- Sasha had been in touch with a contact in NTU with connections in the media (news outlets) Sasha proposed to have the documentary on YouTube, have a press release about the documentary and have the video embedded on the news. Not necessarily broadcast media but a generalist aspect.
- Xavier proposed new websites specialised in food like Food Navigator.
- Posters: Sasha asked on the Burns Farm Meats poster as the next symposium would be a great opportunity to display it. Xavier explained that unfortunately a talk with Burns Farm Meats had not been possible to date to ask about it; Sasha asked James on the poster for Picnic, James had already sent the architecture diagram to Imke.
- December newsletter: input from partners requested regarding Ram's email.
- Sasha asked Tamíris to ask Kate on reporting period.

**Next meeting: Thursday, 30 November 2022, at 11am.**

## REAMIT sub-group meeting, 30/11/2022

**Attended by Sasha Bennett, James Gillespie, Xavier Cama, Tamiris Da Costa, Sahar Ahmadzadeh, Joy Eze and Gautam Samriya.**

The meeting was focused on the status of the symposium preparation and the papers to be submitted to the Special Issue.

Reminder: partner progress reports 4.2 deadline is next Wednesday (7th of December)

### **WPT1**

- The last WPT1 meeting was in November. Gaël has not invited the partners to the next WPT1 meeting since Gladys left the project.

### **Burns Farm Meats**

- Xavier had a meeting with Cathal to discuss the dashboard. Xavier prepared some results to show him and the alerting system he wanted to implement. They also discussed the temperature peaks in the dashboard, over 7 °C. BFM mentioned that the reason is that there are days that they are cleaning or days that they are loading or unloading the chamber. So, it's expected to reach high temperatures on those days. However, there were other few days when it shouldn't have happened, and Xavier believes the alerting system would be a great solution.

- Xavier is analysing how to avoid the alerts sent on those days when they are aware that the door is opened.

- The humidity was also a topic of discussion, as the dashboard is shown very high humidity values. One hypothesis is that the sensor is building up moisture inside the housing box despite being waterproof because the humidity has been increasing gradually and linearly since they were installed. This behaviour was observed for all sensors in both chambers. Xavier wants to validate the humidity results using an external probe or another logger with an external probe. The humidity information is important for this company because they had seen contamination on the meat carcasses in the past. If the humidity is validated, it will be possible to recommend dehumidifying equipment for the chambers.

- The poster was also discussed during this meeting. BFM asked REAMIT partners to be careful when showing results, even though the results are not compromising. Xavier finalised the poster for the symposium, and they agreed to include their name, but it does not include any results.

- James discussed the idea with Marco, and he believes it might be a little energy intensive. The solution would be to have a voltage regulator because he suspects that the second probe can severely hamper the battery performance of the sensors deployed.

- Another solution it is to deploy an Eagle logger, just as a second sort of verification method. James still has two loggers, so that's not technically an issue. James proposes to install it for a month to check if the humidity is at 90% or if it is close to 80% and then check other solutions for improving those sensors.

- James and Xavier plans to install the new logger after the symposium.

**Andy Keery (new pilot)**



- The last meeting James mentioned getting a logger deployed with Andy Kerry from [www.rent-a-fridge.co.uk](http://www.rent-a-fridge.co.uk). On the 19th of November, the Belfast Christmas markets opened, and James installed the sensor on the same day.
- Andy Kerry produces portable rental fridges and rents them for various customers throughout Ireland. Rocket's, a hamburger restaurant, is one of these clients. They are a Dublin-based company who have a stall at the Belfast Christmas market, and they needed a cold store to keep their burger patties.
- They have been trialling IoT technology in their trailers for a couple of years, but he hasn't been satisfied with the results. He doesn't get any historical data from them. If he wants to retrieve the current temperature, he must send a text to a phone number, and then it replied with the temperature. The current monitoring technology has an alerting system, so if temperatures pass a threshold, he still get a text message, but he won't be able to look back and see what had happened or why it happened. He just knows that something went wrong. So, the REAMIT system is much more advanced, and he is enthusiastic about it.
- Having a dashboard where he could log in, have a centralised location where he could view each of his trailers simultaneously because you know his system. In his current system, it is not possible, because if he wants to know the temperature of each trailer, he has to send 10 different text messages.
- From some bench tests, James observed that the sensor's battery lasted 180 days when on trips. However, these vehicles are not on trips, the trailers are in a static location. Therefore, he believes the battery will last until the end of the Christmas market.
- The sensor has a battery backup, so if the external power fails it switches over to use the battery. So, the data transmission should not be affected. If Andy moves the trailer, for example, it probably won't have power going into it. In that case, it'll switch to battery and still upload data while it's on the move.
- There are two different areas in the refrigerator, air on and air off, and the two probes were installed close to these areas. The probe installed in the "air on" area gives the most accurate reading. The exact spot where the monitoring system should be installed is where the air actually gets drawn into the refrigeration unit. Then it is possible to do some calculations to determine the fridge's efficiency.
- James is planning to set up a meeting between Andy, Marco, Marcel and Imke to feature the REAMIT project and because he can be a potential client that would be interested in expanding his operations with Reamit and the technology getting deployed with all his fridges.
- Christmas market is running until the 22nd of December then it's potentially going down to Dublin for three or four weeks until late January. So, there is also the possibility for a second trial in Ireland.
- At the moment two sensors were installed, but only one is working. James needs to go back and repair it, which involves opening up the whole unit.

### **Musgrave**

- Some batteries need to be replaced in their loggers. After talking to Andy, James is keen to move the temperature probes at Musgrave to the same sort of air area of their refrigeration units, specifically in their freezers to check if that alters my results.
- Andy suggested that where the sensors are installed currently is potentially the least ideal place they could be installed, which are maybe going to report the warmest temperatures.

### **WD Meats**

- James emailed James Dooley last week, but he still hasn't heard anything back.

## **WPT2**

- The last WPT2 meeting was on 24th of November. During this meeting was decided that it was the last WPT2 to meeting that was running in the traditional way. The next WPT2 meetings will be shorter (30min ~ 1h) and will run every two weeks rather than only once a month.

- Ram also proposed sub-group meetings for WPT2, as follows:

Picnic: Imke (PL), Jean-Charles (DL).

Biogros: Imke (PL), Jean-Charles (DL).

Yumchop: Sahar and Ram (PL), Sahar (DL).

HMF: Kate (PL), Gautam and Davinder (DL).

Musgrave: James (PL), James and Gautam (DL).

WD Meats and BFM: James and Xavier (PL), James and Gautam (DL).

Raman Spectroscopy: Omar and Ali (PL), Jean-Charles and Sahar (DL).

Smartphone app and 2nd database: Sahar, Kate and Ram (PL), Davinder (DL).

\* Pilot test lead (PL): Work with the pilot test company and define the objectives of data analysis of the pilot tests. Proactively organise the focused WPT2 meetings (up to twice a month).

\* Data analytics lead (DL): Collect, clean and organise the data. Understand the objectives of data analytics. Apply a variety of data analytics tools to achieve the objectives. Work with pilot test leads if additional data are needed or any change in data is needed.

- Some pilot test leads have already set up the meetings and are in contact with the companies. This will avoid redundant work or analysis beyond the needs of the companies.

- James previously prepared a template document which specifies what companies were interested in achieving and what data analytics should be working off to perform the analytics. The document is in SharePoint. The only one that's missing is the Raman Spectroscopy and it would be nice if Omar could add a section on what analytics he thinks could be achieved.

### **Action Omar: Complete the Raman Spectroscopy section**

- The analytics aren't standardised. They are pilot-specific. Some concern regarding the overlap was observed, but once people start working amongst the different pilots, they should be able to be identified it and the analytics leads can link up with one another if there is an overlap on them.

- Picnis is trying to calculate how much ice they need to pack in their bags. BFM are looking at trim loss. Musgrave is analysing early warning detection. Early warning detection may also be appropriate for YumChop and HMF. Reamit might be able to pull in an external API to look if the external weather is affecting each loose pilot company. James suspects it can be affecting Musgrave and HMF pilots. John Charles has already done some work on that, but it needs a further development.

- James noticed that Jean-Charles did not assign to any of those pilots, and we need to ensure that we keep communication ongoing with them

even when he's not part of the assigned pilot tests. Jean-Charles has included all WPT2 analytics partners on his meeting invites. James suggested including him in everyone else's when they are setting up the meetings. Sahar is also meant to be in all analytics partner meetings.

**Action to data analytics leads: Include Jean-Charles in WPT2 sub-group meetings.**

- Sahar is the representative person to be between all of the meetings that are happening and sort of the cohesion between the group.
- Regarding the server, a temporary issue happened again today. Sahar was not able to access the data in the Big Data Server.

**Action to Joy and Sahar: email Andrew to find out the reason for that issue.**

- James will create a training video to facilitate the data export process from the Whysor dashboard. Until the synchronisation API is completed, the Big data server will not be up to date. The last update was on 24<sup>th</sup> of October. So, if the partners want to get any more up-to-date data, they have to perform manual exports from the dashboard. The video will be available in the SharePoint.
- It was discussed in the last WPT2 meeting that Whysor is no longer doing the manual export because it takes 30 minutes ~ 1 hour per week to perform it. Therefore, Ram suggested that Joy and Sahar should be manually exporting the data and then reuploading it. However, Joy does not have experience using the dashboard, so Ram recommended emailing Whysor to collect the files they always sent.
- James created user credentials for everyone on the Remit project to log into the dashboard. According to him, the data of each sensor have to be exported individually, which can increase the time estimated to collect all data.
- James, Ram and Sahar had a meeting with Davinder on Friday with respect to the mobile app. There are some ongoing actions from Davinder. The topics discussed include the Whysor API to populate the mobile app. He tried to go back to talking about deploying the Blue Maestro, but he agreed to try to use the API. James sent him some documentation on the Whysor API, how he could retrieve the data in real-time, and a list of sensors deployed with HMF to get them started. Then it can be scalable to the other pilot tests.
- Davinder will meet with one of the software developers at Levstone on Monday. James also offered them some of his own code if they want to manipulate the data using the API. James hasn't heard anything from him since then.
- The incorporation of data from the Whysor cloud into their mobile app has been an issue for quite some months. There was a little confusion because Davinder asked Ram if he could directly use the Whysor database rather than the data from the BED database. He had the impression that Ram had wanted the app to be fed from the BED database. Now it turns out that isn't the case, which makes things a lot easier, because there's already an API to interface with the Whysor database.
- Davinder did not give the timeline to finalise the app, but he seemed to imply that a lot of the development work on the app had happened, and they just need to look at the API.

**WPT3**

- The authors received the reviewer's feedback on the literature review: major corrections. Tamiris asked for an extension, the final deadline is December 20<sup>th</sup>. She suggested scheduling a meeting with James and Xavier to work on this paper.
- Currently, she is working on revising the LCA paper on the Yumchop case study and the LCA tool. By default, Sustainability gives 10 days to make all corrections. She asked for an extension of 20 days; however, the editor extended it for only 6 more days. So, the final deadline is next Thursday (during the symposium).
- Tamiris received feedback from Paula on the LCA tool and will incorporate her comments and suggestions in the next version of the tool. She expects to send the new version by the end of the following week.

- The meeting with Natalie was postponed because she had a car accident two weeks ago. Natalie said she started working on the revision and Tamiris believes she agreed to make the changes after the reviewer's feedback.
- Deliverables 1.1 and 2.1 should be included in the Partners' Progress reports. Regarding D2.1, Yan received the survey results and got 315 responses. Yan and Lakshmi are working on the data analysis and the statistics needed to feed D2.1.

## **WPC**

- Regarding the symposium, all communication materials have been sent off to be printed, e.g. posters and brochures.
- Mémona reminded all partners to upload their presentations for the symposium.
- Sasha received a few inquiries from UCD students because the registration link in the promoting e-mail sent out by Tamiris was not working. Sasha has been replying to all these people individually and giving them the registration link.
- Valorial has not communicated if they decided on what online platform the symposium will be broadcasted. It is expected that they will send the link and joining instructions in the following days.
- The agenda for the symposium is available on the Eventbrite website and SharePoint. Tamiris suggested including the name of the speakers on the Eventbrite page.
- Sasha is working on the Newsletter for December which will be released shortly after the symposium. Sasha asked the partners who have contributions for this month to send them asap. James plans to send an article about the Christmas Market pilot.
- Sasha and Rich are finalising the documentary. Some partners received some pieces of the documentary, but the complete video will be presented during the symposium. They have got about 15 minutes of footage edited and they aim to have a final video with about 20 minutes. They will also have smaller videos with about 3 to 4 minutes of each pilot test. They are also discussing having it broadcast on television. Sasha is trying to check local channels in Nottingham.
- The press team at NTU will put a press release about Reamit. They asked a few questions on the impact of some of the pilot tests, especially HMF, Yumchop and Musgrave. They want to know a bit about the impact of these pilots, what happens after the project, what technologies we can offer to these companies and how they'll be able to maintain it even after Reamit.  
They want to look at like 3 success stories, put them together in a press release and then attach the full documentary video. This should go out to quite a few different press companies, news, news websites. Sasha will get all the information by the end of December and then put together the press release by January.
- Sasha will be emailing the pilot leaders responsible for these pilot tests in the next couple of weeks to collect the necessary information.

## **Next meeting: 14 December at 11 am.**

- during the phone call. Diarmaid also mentioned that they were actively looking at weight scales themselves or repairing the existing one.
- Cathal Burns was going to be back on the following day and he had sent a message to Xavier about scheduling a meeting as requested.

## REAMIT sub-group meeting notes, 14/12/2022

Attendees: Xavier, Omar, Sahar, Tamiris, James, Sasha, Joy, Gautam, Paula

Date: 14 Dec 2022

- **WPT1:**

Omar started presentation.

He explained the plan for installation of sensors and then plan to have a tour. Ram said that on 6-7 Jan, the sensors are going to be installed and tested. When it finished in the middle of February, BFM was explained. The process of installation is ongoing. There is a plan to visit them. Regarding the new sensors that monitor humidity sensors, it is Eagle logger. James added that humidity probe is a good progress. Marcel already came in the solutions to read more accurate. It can be checked to not have humidity inside before installation.

James intended to talk to Musgrave regarding different position of sensors. One of the probes for temperature needs to be fixed.

Tamiris asked for checking the sensors. There are some companies that work with Whysor that can check the maintenance of sensors, however, it has some cost.

Sahar added updates on HMF and Yumchop.

There was a meeting related to HMF.

Related to Yumchop, there was a meeting and also there are some questions that Sahar is trying to focus. For example study of the factors that affect row materials.

Sahar is going to do some data analysis and be in contact with James, and also regarding route plan, more meeting with data analytic partners.

Sahar contacted Abi, to attend the meeting. She hasn't responded. Sahar Sent an invite to have a meeting on 9 Jan. Sahar mentioned that attendance of Abi is required to provide response to questions related to data analysis.

For WPT2, Gautam couldn't connect. Sahar checked it and reported to ICT. Sahar checked the connectivity and was in contact with Gautam to be sure the problem is solved.

Sahar checked the last time data was updated was 24 Oct. Whysor stopped pushing the data. Last time Sahar and James converted SQL to csv. Sahar will check if there is an update in Nov.

- **WPT2:**

The WPT2 meetings are going to be shorter following Ram suggestions.

There was a meeting about Musgrave that James, Gautam, and Sahar attended. The change in location of sensors was discussed.

James already made a pipeline to access the data, and he explained he has made a video, however, to transfer the data it needs to be explained further.

Sahar asked for anomaly detection algorithms, and James guided to ask Jean Charles.

For HMF, Kate will attend a meeting with HMF and will update.

James mentioned some anomaly detection algorithms.

- **WP3:**

Tamiris has no updates. She has submitted 3 papers. This is her last meeting. She is leaving her work as postdoc. A new student may be recruited in the next month.

James sent an email regarding deliverable. There are some papers to sent to special issue.

There is data available that can be considered as part of deliverables. Yan is on leave, but a meeting can be organized in Jan to discuss about deliverable 2.1.

Regarding 1.1 is already completed as review paper , James explained. Ram is interested to add multinational input in the survey. The survey is not ready yet. Hopefully, there were some progress in Jan.

- **WP Communication**

Sasha provided updates. She thanks everyone involved in the symposium. The BioGross, BFM, and Musgrave posters are made. HMF and Yumchop posters already created.

There is a video is provided. There is 37 minutes vedio and shorter version is going to be made. She had a meeting with Rich. He needs some images from Whysor dashboard.

Changes in temperature, and humidity needs to be animated in a video and to be published in youtube, in the next couple of weeks or beginning of January.

The plan is to broadcast it into the TV. It can be online broadcast. There is a live broadcast related to symposium, and there is around 900 views. An online feedback form is provided.

Newsletter for Dec was published yesterday. It was published in the website separately.

There is an article expectation about Musgrave, but there is no further pressure on James.

At the beginning of next year there is a final newsletter.

The records were submitted related to Work package communication.

There won't be massive load of activities in the next 6 months. There is a paid for new subscription until Jun 2026 for the website. Sasha is going to pay more too even keep the REAMIT website live until longer if possible.

Paula suggested using word press to continue page working after that date.

Sasha is mentioned it can be extended for next 5 years, but after that it may not be needed.

Gautam suggested a bio page on the website. There is a data page that can be added to overview data analysis. It is good to have example of data analytic. Some direct connection to the Whysor dashboard to have live information. Some of the ideas can be discussed in the meeting in Irland. Sasha is suggesting a Teams link to the meeting.

## **WP Management:**

Paulo has some updates from Kate.

Kate asked for partners' progress report 4.2 should be sent before Christmas holiday and should be ready before Jan. The 4.1 report is ready for audit. It was sent first week of Dec. The audit for BED, and UEssex will take place in Jan 2023.

The lead founder accepted modifications. Both MTU, and BED can update their budget.

Share the newsletter. There will be a mini group meeting with HMF. Joy left the meeting. Kate asked her to send another timesheet.

UCD and MTU are going to send their report today.

Tamiris will ask Kate for a person who will be replaced by her.  
The Doodle poll will be sent regarding the date for the next meeting.



## REAMIT sub-group meeting notes, 07/02/2023

Attended by Katarzyna Pelc, Sahar Ahmadzadeh, Gautam Samriya, James Gillespie, Sasha Bennett, Omar Dib, Joy Eze, Paula Borowska and Xavier Cama.

WPT1 Pilot Tests

WPT1 general meeting date

- Gaël mentioned at the beginning of January that he would be organising a WPT1 general meeting sometime in February.
- **Action: Xavier to check with Gaël to organise a meeting to discuss T1 deliverables.**

Raman Spectroscopy, France

- Omar informed that they had been preparing for the following week as they would be renting a truck and installing Raman in it for the trials.
- They had been making some boxes using 3D printing to install all the Raman parts in the box to save space in the truck.
- They were preparing a poster to stick on the truck with the REAMIT and UoN logos.
- They would try to record a video to share with partners during testing with the rented truck.

Burns Farm Meats (BFM), Ireland

- James had been working on preparing the Eagle logger for BFM. The sim card that James had been provided with, by Whysor, did not work in the Republic of Ireland (ROI), and so he sourced a different sim card from a Dutch company called Olivia Wireless. He got it working in Northern Ireland - he had to reflash the hardware with some new firmware – and the next step was to take it to the ROI with his laptop to test it there. This new sim card, James informed, was the only one that could work in Ireland as far as he knew.
- Xavier informed that, a week before, he had spoken to Diarmaid Burns, one of the two owners, as Cathal, the usual contact, was on leave. Xavier asked him about weighing of carcasses to which he said that they were always checking the weights of carcasses going and leaving the chambers, however, at the time they had the weight scale broken.
  - Xavier mentioned to him that there could be the possibility of purchasing equipment, if necessary from the REAMIT budget – no conclusion was reached during the phone call. Diarmaid also mentioned that they were actively looking at weight scales themselves or repairing the existing one.
- Cathal Burns was going to be back on the following day and he had sent a message to Xavier about scheduling a meeting as requested.
  - A meeting was expected to be held the next day with Cathal Burns, James, Gautam and Xavier.
  - In the meeting, the team was going to try to agree on recording weights, as well as scheduling a visit to install the Eagle logger/upgrading the system.



- Gautam asked on the equipment they use for weighing. Xavier informed that BFM had a crane scale integrated in the metal line (rail) attached to the ceiling and used to move the carcasses from the slaughtering spot to the refrigerated chambers.
- **The team concluded that during the meeting with BFM, they should ask about weight of the carcasses, and if possible weights of the trimmed section after the dry-ageing process.**
  - The team did not know if there was historical data from the time the sensors were installed. That could also be discussed with them.
  - The team could purchase a cheap weight scale (approx.. 80 Euro), if necessary.

#### Musgrave, NI

- James had sent an email to Musgrave two days before to see if he could visit their facilities to replace the batteries in 2 of the loggers as they were running low.
- Also, James wanted to change the location of the sensors. As it was, at the time, sensors were attached to the roof. For ambient temperature monitoring, as recommended by Andy Keery, there is a specific part of the compressor where sensors should be located - just below it (air on), where a fan sucks air back in after this having circulated in the van and through all the products. That is the true ambient temperature. Now data suggested that there were issues with the vans which did not seem to match the real scenario, so changing sensor location may improve the recorded data and subsequent analysis.

#### WD Meats, NI

- Marc, at WD Meats, was in contact with James to check in with him and ask about the status of the project.
- Marc confirmed he was going to participate in the qualitative survey interview.
- They were going to have an additional meeting to talk about the trials. James to follow up with him to schedule it. In parallel, James had emailed a lab scientist at Ulster to try to progress the Clostridium trial with their help.

#### 3D Fluorescence trial, NI

- In the next few weeks, two different people should have had the chance to run some tests with 3D Fluorescence: Omar (James will be sending a Fresh Detect to him) and a colleague of James at UU, Jordan, who holds a PhD in spectroscopy.
- The idea is to get two small data sets to help deliver on 3D Fluorescence reports.
- James also received the Master thesis of Tahmina's student - some data on strawberries and chicken breasts which may help write the reports.

#### HMF, UK

- Sahar informed she had no updates related to T1.

#### Yumchop, UK

- Sahar and James reported that there had been follow ups to Abi regarding the placement of an extra Eagle logger that James had available. The Eagle logger was intended to be placed in one of their

vending machines. James emailed Abi to see if 22 February would fit for a visit in London, to place the logger in Victoria coach and train station. Previously, Ram had expressed that he was keen on this idea, as well as Abi.

## WPT2

- Sahar explained that there was a connectivity issue regarding the Big Data server. Sahar had emailed Andrew about it that same day, but she got an automated response informing that he was on leave. Sahar will be in touch with ICT to solve the issue as soon as possible.
- Sahar shared her screen and showed an excel file that she had made regarding T2 deliverables based on the application form. This excel file listed the deliverables with their respective title and current status.
  - Del. 4.1 (creation/launch interface): Sahar had asked Imke about it.
  - Del. 5.1 (Big Data platform capabilities): Sahar explained that she needed to add a brief description on Big Data platform capability to collect and store sensor data.
  - Del. 5.2 (Big data server performance): Sahar explained that she had already completed this work.
  - Del. 5.3 (web-interface): Ongoing work with Levstone.
  - Del. 5.4 (Big Data user manual): Sahar told the group that she had already work on it and she wanted to check with Gaël if further work was needed.
  - Dels. activity 7 (app): Work being done by Levstone.
- James observed that some of those deliverables had been planned long time ago and may not fit exactly with the activities that have been carried out, for example the self-enrolling feature for agri-food companies. It may be worth checking with Ram how to phrase or address those deliverables.
- James and Xavier observed that a general WPT2 meeting to talk about deliverables could be very beneficial to discuss the direction of deliverables. Xavier asked Sahar if she could ask the wider group for a T2 meeting.
- Gautam asked Sahar if she could share the excel file with deliverables' status.
- **Sahar to upload the excel file on SharePoint.**

## T2 subgroup for HMF, UK

- Gautam explained that the last T2 HMF meeting had been held on the previous week:
  - Modelling approaches had been explored: decision trees, random forest, regression linear models. However, score statistics for the models were not high, and Gautam and the group were trying a more granular approach to improve the results.
  - Gautam was now trying to take each journey as a single vector - as suggested by Daniel Kelly hoping to get a model with better scores. To do so, it would require some transformation on the data.
  - Other parameters had yielded good results, e.g. VIF factor.
  - Gautam explained that a new feature had been created and included in the dataset for all of these analysis: the rate of change of temperature, taking the difference from the start and

the end of the journey, with start of the journey being the point of minimum value temperature.

- Cross validation tests had also been conducted to check for accuracy – collinearity, auto correlation in the data set.
- As a conclusion, Gautam explained that more data was needed to obtain a better accuracy and more reliability.
- James asked Gautam on sharing his findings with him. They may meet privately to discuss these analysis in more detail.

#### T2 subgroup for Yumchop, UK

- Sahar explained that there was no Yumchop T2 scheduled yet, that they were waiting to hear from Abi on a potential visit for the sensor and/or the text alerts for the defrosting cycles before organising a new meeting.
- Sahar explained that she was working on statistical process control analysis and discussing it with Ram.
- James informed that in the previous meeting a new question had been raised: Abi had found that she was getting text alerts when the refrigeration unit was defrosting and was aware of that. In other words, the question was, is there a way of automatically detecting a defrost cycle versus an actual anomaly?
  - James spoke to Andy Keery, and he said that from his experience, each of these commercial fridges has their own controller unit and defrost cycles are done on a timer. The group had emailed Abi to see if these alerts had been received on a periodical and predictable basis, e.g. a particular time every day or every week. Andy had said that there should normally be a specified time, once a day the fridges would shut off for defrosting before turning back on.
- The idea would be to deactivate alerts when these defrosting cycles occur.
- Sahar had not received a response for the defrost cycles yet.

#### T2 subgroup for Musgrave, NI

- James explained that there were no updates on Musgrave because analysis had been maxed out at that stage with the available data.
- There will not be major updates until James can replace the batteries that have run out and change the location of the probes.
- James had emailed Musgrave to try to find some time for a visit in the coming weeks.

#### T2 subgroup for WD Meats (NI) & BFM (ROI)

- The idea was to collect all the full data set that had been collected from WD Meats and then perform a comparative study with the data that the group was going to collect from BFM.
- As for WD Meats, the data had been collected and it was a matter of Marc Logan typing in the results in a spreadsheet and sending it on to James. James was going to be in touch with Marc.
- As for BFM, this would be discussed in the next meeting as there would be new updates after talking to Cathal Burns (Cathal was coming back from leave that same week and the subgroup was going to have a meeting with him to talk about recording weights).

## T2 subgroup for Raman, France

- A meeting had been held that same morning with Omar, James, Jean-Charles, Ram and Xavier. Omar summarised the work carried out:
  - Jean-Charles had been able to change the format of the data and had it transferred to his (SenX) server.
  - They had been capable of doing the baseline correction and the smoothing of Raman spectra.
  - They discussed about further steps on how to further treat the spectra and to perform analysis to ultimately reach the final goal, which was how to differentiate the food sample using the spectra based on the freshness of the sample.
- The next step was going to be sending all the data to Jean-Charles and then he would start analysing the data.
- The next Raman T2 meeting was going to be on 1 March, 2023.
- James and Omar agreed that the work represented an excellent opportunity to deliver something unique, a classification model capable of determining whether the meat sample was good, about to deteriorate or already deteriorated. The model could be expanded from there, but the priority at the time was to build such a model with the existing data.

## WPT3

- James and Xavier had met on the previous Friday (03/02/2023) to discuss deliverable T3 2.1 related to current and future identified REAMIT technologies: from the analysis of the quantitative survey, several inferences could be made to inform that deliverable.
- James had also contacted Lakshmi Swamy at Essex by email on the previous day to ask about the possibility of including findings of the MOAT/ATOM model, which was also based on the quantitative survey but having a more theoretical approach.
  - If a meeting was to be held with Lakshmi, to include Kate in the meeting.
- James explained that the qualitative surveys had begun. Trevor had finalised the set of questions and was leading that study with one of his PhD students.
  - The first interview had already been completed with Natalie and Mike (HMF).
  - Another interview had been booked in with Robert Gallagher.
  - Cathal Burns informed he would be available to pick a time soon. Similarly, Marc Logan also expressed he would participate.
  - No other confirmations had been received. James explained he had sent the booking link to all pilot-test-company partners plus Dominic (the company the REAMIT team visited during the symposium in Nantes) as Ram was keen to involve a French perspective.
- Kate was going to see Abi (Yumchop) on the 27th on February as she was coming to Luton for the event “Women entrepreneurs in the agri-food industry” so Kate could talk to her if she did not respond before that. **James to forward the email he had sent to Abi to Kate.**
- Kate also mentioned that she would be sending an email to Abi that same day to ask on James’ potential visit so that he had enough time to book the flights. James could also be available a day or two before the RAC meeting in Colchester.

## WP LT

Xavier reminded the group that Tamiris was organizing a meeting on REAMIT 2.0 in the coming days/weeks – brainstorming to discuss possible funding opportunities and ideas for developing proposals.

#### WP M

- **Action: All partners to send the minutes of the previous RAC meeting held in Dublin by 17 February to Kate.**
- **Action: Sahar to send the minutes of the sub-group meeting of 14 December.**
- Kate explained that she was going to have a meeting with the REAMIT officer at the Joint Secretariat (JS) with Yan and Ram also. The new officer, Maëlle, wanted to get to know the project plus it was an opportunity to talk about the project closure and ask about all of the things discussed during the last RAC meeting.
- Kate informed that there had been several exchanges about the eligibility of claiming the Guinness tour costs.
  - There had not been a clear follow up or benefit for the project after the visit.
  - Yan and Ram had not given any feedback, and neither the auditor.
  - For these reasons, Kate considered this as non-eligible cost. From BED, it would not be claimed. If other partners could claim the cost of the entry ticket to the Guinness storehouse - given a different auditor/institutions guidelines, that was okay but BED would not claim it and the cost of the guided tour would not be claimed either.
  - The team needed to reimburse Xavier for the cost of the Guided tour. Xavier could set up a PayPal link for attendees to give their part of the cost, or else to give the money during the next RAC meeting.
  - Kate and Xavier had exhausted all possibilities to try to claim eligibility for these costs.
- Kate explained that the invitations for the next RAC meeting would be sent to partners soon.
- Kate needed confirmation from UCD and UoN with relation to the on-the-spot audit.
- **Action: Xavier to ask Fionnuala when the on-the-spot audit was going to take place as each partner needed to have one completed before the end of the project.**

#### WP C

- Sasha talked about the documentary:
  - The work related to the documentary had been completed.
  - There were different versions of it: a 40 minute long version, a shorter 8 minute version available on Youtube, and shorter versions for each pilot test.
  - One of the requirements in NTU was that there was a subtitled version of the documentary. Sasha had also completed it and was available on Youtube.
- A press release had been carried out on the previous Thursday (02/02/2023). The REAMIT social media channel contained the link to the press release.
  - It had been sent out to different online news outlets.
  - The press release also contained information on new achievements: the policy document on the UK government website that Ram had submitted.
  - Sasha explained that by typing the title of the press release “Pilot study shows how zero waste in food supply chain can be achieved through smart IoT technology” on Google one could see

- all the news outlets that had picked up the story, e.g., Tech Explore, Logistics Manager website, among others.
  - Sasha mentioned that Ram had suggested to keep a list of these news outlets and have it in the project handbook. Maybe Sasha could make a section in the communication strategy document as well for it.
- Kate observed that it would be helpful if all partners approached their marketing teams and prepared a similar piece of news to be publicised by their university networks so there would be coverage in different countries.
  - **Action: Kate (BED), Xavier (UCD), James (UU), Omar (UoN), Gautam (MTU) to contact their institution marketing teams about it.**
  - Maybe not so long a text as Kate was told by her marketing team that it was too long.
  - Sasha explained that the marketing teams should be able to create their preferred version, perhaps taking a few paragraphs from the original, but there should not be the need for partners to make (tailorize) their own version.
  - The team discussed the possibility of replacing Usha's picture to one of the institution's lead (e.g. Fionnuala for UCD) plus a quote they said taken from the REAMIT documentary.
- Sasha mentioned that Ram had approached a secondary channel of the BBC. Sasha needed to check with Ram what was the update on that.
- Sasha asked Kate about the possibility of sharing the documentary in the Interreg Youtube channel as Kate had a meeting with the JS that day.
- Sasha was also working on the newsletter for February, which was almost completed. She had received comments from Ram and was working on them. She was also expecting comments from Kate.
  - Kate asked for a new item to be included: Yan and herself made a presentation in the annual conference at Bedfordshire.
  - Sasha asked James about the Musgrave section, if he could ask Musgrave for permission to publish the photograph they had taken on site as well as the article itself. James to check with Robert and Jon McKenzie and give them the revised article.
- As for the timeline infographic, there had been some feedback recently and Sasha needed to put time on it. In the notes of the RAC meeting, there should be a list of comments about it made on that occasion.
  - Sasha wanted to include the types of companies that the REAMIT project had approached in the past, which should it be in the reports. Sasha asked Kate if she could check it and send it to her.

**Next meeting: TBC – doodle poll to check availability of partners due to some people in the team taking leave.**

## REAMIT sub-group meeting, 28/02/2023

Attended by Katarzyna Pelc, Sahar Ahmadzadeh, Gautam Samriya, James Gillespie, , Omar Dib, Joy Eze, Paula Borowska and Xavier Cama.

Sasha was on holiday.

\* Action items are marked in bold

WPT1 Pilot Tests

WPT1 general meeting date

- Xavier updated that WP T1 meeting on deliverables happened in mid Feb. Gael sent a mail on updates and discussion of this meeting.

Raman Spectroscopy, France

- Omar informed that they rented a truck and installed Raman system in it and carried out some trial runs in the city. Omar updated that to minimize usage of space in the trucks, they 3 D printed some plastic boxes to house the parts associated with Raman setup and attached them with screws to the box fitted with Raman system. Omar showed pictures of this setup. Omar also updated that signals captured through Raman were fed to a laptop for further interpretation and the analysis. This could further be enhanced in future by using a tablet fitted with sim card, so that this processing of data could be done in smaller space and with GPS or internet connectivity.
- Omar shared that they made couple of important observations they made during the trial runs of the rented trucks fitted with Raman system:
  - Vibrations arising from road bumps affected the Raman signal.
  - Sample holder's shape needed to be adjusted according to the tested products.
- Omar shared that based on findings from Stage II phase, Raman spectroscopy is a useful tool for observing changes in quality and chemical composition of the chicken products. However, it should be noted that changes require a certain amount of time to occur, at least four days in the case of chicken products. Therefore, it is not necessary to run Raman spectroscopy all the time during transportation. Instead, it is recommended to analyse the food product using Raman spectroscopy once or twice per day while the truck is stationary to avoid any vibrations from road bumps, which can impact the accuracy of the results. By doing so, a good quality spectrum can be obtained, allowing for accurate assessment of the product quality and chemical composition while reducing electrical consumption.
- For electrical consumption, Raman system can also potentially be connected to power system/battery of the vehicle itself to get its power. Since they worked with rented trucks in current trials, they didn't change the power and circuit components of the trucks, but Raman can be made to work with battery system of the vehicle.
- **They also recorded a video of these trial runs and plan to share with partners during upcoming RSC meeting in UK.**



- Kate asked Omar – for how long they rented the trucks. Omar replied for first phase it was 4 days, and for second phase it was 2-3 days. Omar also updated that they can also align the box components of Raman set up vertically. Omar mentioned that they were satisfied with current work on Raman. **For next steps, more models such as determination of protein composition, microbial load, etc. can be created to link with the Raman system.**
- Kate asked if they are doing any data analytics work for this pilot test. **Omar replied that they are working with Jean-Charles of SenX for data analytics. He imported the data and analysed the spectral data. We want to reach a stage where results from the data can be shown in a simplified way to any audience. Omar said that would need some more efforts on the data analytics part.**
- James asked Omar if Raman can be run on small microcomputer systems such as Raspberry Pies? Raspberry pie can have a GSM sim as well. Omar replied that Raman software Oceanview can be run on Windows system only.

**Action: 1. Omar to share video of trial runs in RSC meetings.**

**2. Omar to explore next steps of modelling, such as determination of protein composition, microbial load, etc. can be created to link with the Raman system.**

**3. Omar to work on data analytics part with Jean-Charles.**

Burns Farm Meats (BFM), Ireland

- Xavier updated that he and James visited the Burns Farm Meats in Sligo in previous week , a meeting that was decided on a very short notice. They installed the eagle loggers, to validate the humidity readings. Currently on dashboard, the humidity readings were very high, these loggers would validate these reading. They also installed binary sensors on the doors of the chambers to indicate if the chambers are loading or unloading. This will help to avoid and identify false positive alert.
- The sim card used on Eagle logger didn't seem to work in Ireland at Burn Farm Meats, and also the network reception there is poor. Xavier is planning to purchase another sensor to read humidity measurements correctly. The idea is to have sensor having humidity probe placement such that it doesn't get clogged by moistures which could be currently causing false reading.
- Apart from this, on visit they also captured some weights measurement, to get measurements of spoilage and wastage in chamber. BFM also provided an approximate cost to the company due to the food waste and spoilage.
- **Xavier also updated that they would plan to visit again to install new logger and record more weights as we would ideally like to have more weights for their study.** Xavier sent a mail to the team on updates of this visit.
- James updated that he got an email from Australian supplier Ocean controls which mentioned that they currently do not have the desired sensor in stock. They have some alternate sensors, but they might need some setting changes that could be an overhead needing support from Whysor.
- To support measuring humidity correctly, alternatively, **James also mentioned that he is thinking to build a small system having sensor and dashboard, for BFM, a local server hosted onsite BFM, which would cost 30€ or 40€.** James also updated that he has not discussed purchasing of new sensor from the Australian supplier with Ulster University as he just got the reply in morning from the supplier.



- James and Xavier also discussed a simpler way to record humidity would be to install an Eagle logger with sim card removed and record the humidity readings for a month, and then analyse the data later.

**Action: 1. Xavier to plan visit again to install new logger and record more weights, to have more weights for their study.**

**2. James to explore building a small system having sensor and dashboard, for BFM, a local server hosted onsite BFM, which would cost 30€ or 40€ for humidity measurement validation.**

Musgrave, NI

- James updated that previous Monday he visited Musgrave and changed the location of the temperature probes for monitoring ambient temperature.
- James also updated that he also replaced batteries in two of three sensors. He also mentioned that he found the two sensors probes had got detached from the walls of the vans. So he rewired them, replaced batteries and put them back in appropriate location in the compressor, near to where air got sucked in, so as to monitor the ambient temperature. The van pertaining to third sensor was not in warehouse and had gone out for engine work, thus James could not replace battery for that sensor or check it or change its location. James would be updated by Keith at Musgrave when the third van is back in warehouse.
- James updated that the temperature readings obtained from sensors after these interventions, have improved a lot although they are still some above then expected values. James however expressed satisfaction with the new data.
- **With the new data set populating in coming days, James plan to prepare research artifact on appropriate location for the sensor probe in such vans based on the sensor data and prove if Andy's initial hunch regarding sensor location was indeed true.** James also plan to replace and check for third sensor when it becomes available.
- **James also updated that Tamiris plans to do LCA with Musgrave as 5<sup>th</sup> LCA study for the project and he has asked for the relevant data from the Musgrave.** James also had a meeting with Musgrave for qualitative survey interview.
- Kate asked what the optimal temperature range is. James updated that for freezer it is -18 C and for fridge it is 2-5 C. James updated that he is getting readings of around -20 C from Musgrave freezers currently after the intervention on sensor locations and these readings are much better than previously recorded values so far.

**Action: 1. James to explore preparing research artifacts on appropriate location for sensor probe in such vans based on sensor data.**

**2. LCA study for Musgrave by Tamiris.**

**3. James to follow-up for replacing and repositioning third sensor in Musgrave van.**

WD Meats, NI

- James updated that he had a couple of meetings in the last few weeks. First of them was with Mark Logan at WD Meats. He discussed both the Clostridium pilot and also the Dry Age pilot with him. Things have been quiet with WD meets for a while, but James said that he had a really nice meeting with him and he would visit him on Thursday this week.

- With respect to the Clostridium, James updated that they now have engaged a new lab scientist at Ulster, called Caroline Conway. She has been involved with the Clostridium trial from the start and was really the contact point for James Dooley. He was using her for advice and what he thought the best kit was the order for the Clostridium Master Mix, et cetera. James Dooley had put James G in contact with her just before he went off at the end of summer to liaise with her going forward while he was absent. But when James D got back, he never actually made contact with James G again. James said that Caroline is very willing to help with the project. Joan spoke with her about the finances. Caroline is going to join James for an onsite meeting at WD meets on Thursday. I believe Joan intends to join that meeting as well.
- Mark mentioned that he has some questions about the intensity of the clostridium and how they could use their current lab set up to determine the intensity of the clostridium. That's really what he's interested in. From the screenshots that Market sent from their PCR machine, Caroline thinks that the data maybe even already there, and they're just maybe not sure how to interpret it correctly. But nevertheless, she's more than willing to attend, maybe to talk them through their equipment. We have lab facilities as well at the university so she's also mentioned that we could do some benchmarking on Clostridium.
- Mark told James that they've got Clostridium on site right now so there could be opportunities for them to be running samples of Clostridium at the Ulster lab. Caroline will be the one running all the samples seemingly it was her who done the benchmarking test as well over the summer. She runs one of the big labs at the university, she's the lab manager. She doesn't think that anything that Mark raised with James in the meeting is unachievable with what we've actually got at the university at the moment. But she also said, we could potentially make up clostridium in different concentrations, et cetera, if that's going to be required, or maybe work with the lab in Bristol if that's who they're benchmarking with at the minute. She's got ideas, she said a couple of open questions because all the problems are not completely clear to her exactly. But hopefully Thursday clears all of that up. So that's hopefully going to be a productive meeting with respect to the Dry Age trial.
- **James said that Mark proposed that we do at least two more full runs before the end of a project,** one full run without the parameters changed at all again, but this time with full batch tracing. James mentioned to Mark that he had this idea where they were going to benchmark essentially the results from Burns Farm meets with the results from WD meets, but that would actually need trim loss data, as well as water evaporation data. James said that any of the data he has thus far was only for water evaporation, which Cahill at BFM has also provided. But he's now also given them the trim loss, the actual weight of the beef that he's had to cut off and discard because it had dark facing on it or there was mould on it. James spoke to Mark and he said that they actually do measure the previous runs that we've done. Maybe he could trace it all the way back. But it didn't sound like a trivial job and it seemed easier just if they do one full run with that in our mind that they would be doing a full traceability from start to finish, batch tracing, trim loss, water loss, et cetera.
- **James said that Mark also said that he would like to reduce the temperature by one degree Celsius and do another full run again with full batch tracing. So we get the trim loss data as well as the water loss data. So that could be a study on WD's own data set. But we could also then combine that with what we're collecting at Burns Farm each use as a comparative study. He did say that Nigel, who is his boss, is very protective about the parameters that they have set for the dry age now and may take a little bit of convincing. But if we help them with the clostridium problem,**

**hopefully that would sweeten Nigel a little bit and convince them to let us change the parameters for one dry age cycle.**

- There's been a couple of questions about the clostridium trial, whether it's really fitting within Reamit because qPCR isn't really IoT. James mentioned this to Ram and he said that because clostridium has been mentioned so often since almost the start of the project, that we should still report on it. But if it's completely Reamit, he was not sure how exactly we're going to spin it. But it seems that this collaboration is going to help them hopefully get us some data from the actual IoT study that we have. So James think that we have to pursue it either way at this stage.
- Kate asked James, how would he play with the parameters in the dry aging chamber. James replied that Mark has proposed lowering the temperature by one degree Celsius. That's all he wants. But Nigel is even protective of one degree Celsius. He said it's going to take quite some convincing to get Nigel to allow him to do that. But with the clostridium work, hopefully Nigel agrees.
- Kate asked James, currently it is what temperature. James said it is somewhere between one and two degrees Celsius.
- Kate asked James about Caroline. Is she from Ulster University? Is she a colleague of James Dooley? Is she replacement of James Dooley? James said yes, basically in the project.
- Kate asked James how much time would she be in the project? James said she didn't give a number. She said, depends on how much work there is to do. It can either be added on as a percentage. It's called a journal transfer, it's basically a way that departments can bill out other departments in Ulster.
- Kate said with this new development with Caroline, hopefully, maybe there would be some progress. James said he had not been in contact with James Dooley since he left, but Caroline is in the office.
- Xavier commented that on the Clostridium trial, it's true that at this stage maybe it cannot be called work related to IoT sensors and data analysis, but he thinks still there is some justification that it can be made about food waste, as if there's Clostridium in food, everything goes to waste.
- James said that at some point they were thinking about getting Clostridium sample over to Omar, but he wasn't sure how it might happen or how it could happen.
- Kate asked James if he could get samples to meeting in Colchester. James said he can but it depends on airline rules. He said that he would need to do a little bit of research into transportation conditions that might might have to be packed with dry ice and things like that and also if it'll need to be signed.
- Kate asked James but would he take it from WD Meats or from Ulster lab? James replied from the lab. Kate said as James mentioned that they now have clostridium in the factory, it appeared in last week or so, would it be possible to collect a sample from WD Metas? James said that Mark said to him that he was hoping to have a few swabs frozen. But he also said that once he freezes it, he doesn't think that the results are as replicable. It's just a hunch, but he doesn't think that it's as replicable once he freezes it and then does it again.
- **Action: 1. James to do two full runs for the pilot test based on Marc's suggestion, including with parameter changing – reducing temperature by 1 degree Celcius.**

- **2. James and Marc would work to convince Nigel for parameter changing.**
- **3. James to do comparative study of WD Meats and BFM.**

### 3D Fluorescence trial, NI

- Kate asked Omar what kind of clostridium bacteria would you need? Omar replied that detecting bacteria using fluorescence is very difficult. Spectroscopy goes for the high density of molecules present in the sample. For eg. if you have meat, spectroscopy will check for proteins, it will not check for bacteria. The signal for the bacteria is very low as compared to signal for proteins.
- Kate asked Omar you are not able to detect specific type of bacteria with this technique then? Omar replied no, it's very difficult. Omar replied that there is bacteria species you can buy and they are concentrated, it can be grown and you can check the signal. You don't have to get meat itself to test with fluorescence.
- James highlighted that we've only got DNA rather than the bacteria itself.
- Omar replied that we can isolate a small piece of meat. We nourish in order to have the certain amount of bacteria, certain numbers, a few, then we can detect the signal. It's a long procedure, but you can detect the signal. But you have to isolate it, concentrate it, then check for the signal.
- Xavier asks that in this case with DNA, is it worth trying? Because it's not the bacteria itself, it's just the DNA. Omar replied, yes. You can check the nucleotide signal on the spectrum. You can check if the signal could be due to any concentrated DNA component? You can see everything. But if it's mixed with other food products, it's difficult because there is another signal that's way higher intensity than the signal of bacteria. So it's masked. If this is possible, then any type of spectroscopy will abolish all the quality testing or standards that have been used in the laboratory.
- James asked Omar if he thinks there is anything worth pursuing with respect to spectroscopy in the project - the fluorescence, Raman or anything else. Omar replied that for the Raman, for example, or the fluorescence, so what you can do is, for a meat industry for example, you can fasten the quality control procedure. So instead of taking a piece of meat to the lab for four to five days in order to do all the tests, you can do it in five minutes with the Raman spectroscopy. This will, for example, reduce food waste by telling that this food product need to be processed as fast as possible because there is a risk of deterioration if you store it for more than ten days in row storage. So this, for example, is the importance of Raman or any type of spectroscopy.
- Omar also said that if you want to link bacterial speeches, the presence of this bacteria, you have to create a model. You can create benchmarking such as a given spectrum of fluorescence is for, let's say, a certain quality of product corresponding to a certain load of bacteria (a number). So when it spoils further, this load of bacteria increase, other quality parameters will decrease and you can check with the spectrum you have and you can relate all together in one big model. So in the future, any spec

trum will detect the type of the quality of the product and the number of bacteria present in the food. So this could be general approach.

- James and Omar then discuss the observations made by Omar on a signal sample sent by James to Omar regarding Fresh-detect signal on a milk sample. James updated that there is a small experiment he has been performing at the Clostridium lab with his colleague Jordan Vincent, and there's also a PhD student.

They

have been taking some measurements with the fresh detect and they came up with an idea of applying the fresh detect for the detection of milk spoilage. This was mostly motivated by recent news articles where Morrisons, Co, Op, Tesco's, etc., are now removing used by dates from hundreds of products, one of which is milk. They're now advising that the customers use the sniff test to detect the quality of the milk and whether it's safe to drink. So it can make a nice story from a writing perspective to justify why you'd be interested in looking at using handheld spectrometry for measuring quality and for getting an indication into spoilage or not if there's a device to report that, rather than only relying on your sense of smell. So we've been performing some simple experiments, not awfully robust at the moment,

useful in the correct spectrum for milk. James had a couple of emails with Mathias and then also had a call with Omar before he went on his leave. He

has been discussing with Omar, there are some results that he recorded over the space of one week last week. Mathias has given him some ideas for basically a second iteration of this. It doesn't take very long to perform something like this. Omar and Mathias are probably along the same vein, whereby need is for taking ten or 20 recordings maybe in each session. Mathias has also

sent him an email saying there should be a way of configuring the fresh detect to take maybe 20 scans back to back without having to manually press the button each time. Mathias said that the initial results look very interesting and promising. James said he can hopefully continue working with Omar on this and we can maybe get something usable in the next couple of weeks. He is quite encouraged by the initial results that have been recorded.

In the background, they have various other spectrometers at the Ulster Lab - they've got many other fluorescence, near-infrared and Raman spectrometer as well. They could perform bench testing at the same time on other spectrometer devices. He's quite knowledgeable as well in the field and it's been productive.

- Xavier asked Omar if it is good to scan the same spot multiple times with 3D fluorescence in succession? Omar replied that it won't affect the milk composition, but it's preferable to do several spots because the milk is not homogeneous, not all the compounds on the same position. So, for example, in the surface you will have different position than in the middle, for example, if you do fluorescence. So that's why several spots are taken and the average fold will be recorded afterwards.
- Kate asked James if he has received the sensor from Bed from Sahar? James said No.
- Kate asked Sahar, is there any news on this fresh-detect sensor? Have you posted it? Has somebody collected it?

- Sahar replied that she tried to post it and there were some issues. She told it to Dr. Tahmina and she sent an email and she asked to everyone who wants it to come to university and take it. Sahar sent Anthony email also to Professor John Kanda, I think, and then she replied that she will take a carrier and she will organize it. But Sahar received no email, so at the moment it is on her desk.
- Kate asked James if he was still thinking of organizing a courier? James replied that this was to allow them to do some testing at the same time as maybe getting a device over to Omar, but he was wondering at this stage if it's just as handy to pick it up at the RSC meeting. He did look at the carrier and spoke to one of the office admin staff and he said, no worries to organize it, but you need to sort of coordinate it with who you're working with and make sure that they're going to be at the right place at the right time and started sounding messy.
- **Kate asked James shall we bring it to Colchester? James replied yes.**

**Action: 1. Kate to bring sensor at Colchester meeting for James to pick up.**

HMF, UK

- Kate updated that there was a qualitative survey interview with HMF that was done by Trevor and a PhD student from Ulster. She couldn't attend it as she was on annual leave then, but she read the transcripts of that meeting. Kate shared that Natalie of HMF is, in general, very happy with the REAMIT system and sensors. But she is now expecting to see the next steps with the pilot test. Firstly, She would like to try the smaller and lighter sensors in pilot test. Kate said that Marcel updated that he has the sensors available and they can be used. Secondly, she would like see results from the analytics, the app and how they all link together.
- Kate updated that Devinder made a presentation on the app prepared by Levstone in previous weeks. Tahmina is excited about the app and the idea is to **have this app at a ready stage for the HMF pilot test to begin with and test for its use case, and then share it with Natalie to test the app in her environment. Devinder was to present a finalized app in previous days but it has still not been done as yet. Tahmina is enthusiastic about this work and wishes to develop more research work/studies on this. Kate is also interested in this and is planning to do research work on duality of IoT sensor technology and use work with HMF as first case study for this research.**
- Kate discussed above with Ram on next steps for this pilot test. Ram advised that we should now discuss about closure of the project with the pilot test companies and not adding more elements to the pilot test. Kate updated that Ram has started to draft mails to the pilot test companies regarding the pilot test components ownership after the project gets closed – who would own the sensor, cloud, system, etc. One agreed idea is that ActionSense, who is a sub-partner in the REAMIT project and a spin-off company in Ulster University, will take the ownership of all sensors and would be a link between the pilot test companies and the Whysor, who will host the cloud and continue to provide the dashboard and alerting system. So there are many approaches and things going on currently. Kate expressed confusion with regards to further direction of the work on the pilot test and would seek to get more clarity from Ram in coming days.

**Action: 1. Devinder to provide finalized app.**



**2. Finalized app to be tested completely for use cases of HMF by REAMIT team and then provided to Natalie for her testing in HMF environment.**

**3. Kate is planning to do research study on duality of IoT sensor technology and use work with HMF as first case study for this research work.**

Yumchop, UK

- Kate updated that she met with Abi yesterday, who was at University of Bedfordshire for an event on women entrepreneur in agri-food sector, as a speaker and she gave a presentation on her experiences at Yumchop foods. The event was organized by Yan and her colleagues and was under a project Erasmus. Abi spoke about her experience and role as a founder at Yumchop foods, director of the company and everything she does daily as a mother, a manager, a woman entrepreneur – all different roles. The event was about women empowerment and how to bridge gender gap in the agribusiness sector.
- Kate mentioned that **Abi expressed her happiness with the REAMIT work with Yumchop. She now wishes to install more sensors in Vending Kiosks** at London Victoria station, Coach station. She has mentioned to have a meet on 8<sup>th</sup> March, with 99% certainty as she was waiting to get some replies on some other commitments regarding meeting times before she could confirm, but **she hoped that she is 99% sure that the will meet on 8<sup>th</sup> March at 11 am.** Kate asked James if he booked his tickets for this meeting. James replied that he just booked the ticket. Kate updated that there would be someone coming from Abi's team as well to meet them for installing the sensors.
- Kate said that one new sensor would be installed in a vending machine, two sensors in two other vending machines, and Abi would also like to get sensor installed in her trucks like Musgrave pilot test. A recent positive development at Yumchop has been that they were approached by Sainsbury's, a large supermarket chain in UK, to sell Yumchop's frozen food at Sainsbury's. Thus, Yumchop would be supplying food to Sainsbury's, which needs to be done at lower cost. For this, yumchop has also purchased some machines to automate some work and reduce human labour to save cost. Yumchop would need to send the frozen food to Sainsbury's in vans and thus wish to install sensor and alerting system for food transportation through Vans as well.
- Kate also updated that Ram had recently sent mail to Yumchop regarding ownership of sensors after the REAMIT project is completed. Ram has proposed multiple options regarding sensor ownership, which would decide whether the pilot test companies would keep the sensor with their ownership or not.
- Gautam asked Kate if going forward pilot test companies would be the owners of the sensors. Kate replied that the companies are being provided three options – first is that they would become owners of the sensors installed and would pay ActionSense and Whysor a service fee per sensor for using the dashboard and alerting system of Whysor cloud, this fee would be like 10 euro per sensor; second is that they would keep the sensor, have their own cloud and alerting system and maintain it themselves without any need to pay an fees externally; and third is that they would remove the sensors and would go back to the pre-REAMIT status. So they would be offered three options to choose from and

we plan to have one on one meeting with all the pilot test companies in the project and would ask their decision for themselves.

- Kate updated that we would need to purchase new sensors for installing at Yumchop and at HMF. Mercel has a sensor which can be installed at HMF, but for others we might need to purchase more sensors and she would need more clarity on this from Ram and Yan as we are discussing on project closure and they both have different ideas on purchasing the new sensors. Also, there is limited timeline now from the funder to incur expenditure on sensors.
- Kate also discussed that we are talking about considering different deadline for different kind of expenditure. For eg, May end for expenditures such as travel, equipment, etc, June for other costs, and only staff costs and overheads to be considered till the 9th of July, which is when the project is scheduled to complete. There are also costs related to audit at partners. The funder has not agreed to provide 3 month extended timeline for for such costs, rather just two weeks, i.e. till 23 July only. Kate's contract would be completed by 9 July and Yan mentioned that she won't be able to close the project on her own, so Yan wants Kate to close the project before her contract gets completed.
- Kate urges all the partners to complete the audits by mid-June - anticipate invoices, anticipate pay slips and have the auditors do the audit in June and submit report to lead partner. Kate would need two weeks to close everything. So that's why we're thinking to end all the expenditure related to audits at partners level by mid of June. This would be the only anticipated invoice and submitted to lead partner around 24-25 June. We will be discussing this more in Colchester.

**Action: 1. Kate and James to meet Abi and her team on 8 March at 11 am to install more sensors for Yumchop.**

**2. Kate to discuss more with the group in Colchester, on various timelines regarding sensor purchase expenditures, audit reports and project closure timelines.**

#### WPT2

- Sahar explained that there was a connectivity issue reported by Gautam regarding the Big Data server. Sahar had emailed Andrew and had an in-person meeting with him. As pe Sahar, the issue is now solved, and she checked the connectivity to the server yesterday and it seemed to worked fine.
- Sahar also updated that she had a meeting with Devinder where he gave her demo of the app and its functionalities. He also gave her a tablet. Based on the demo, Sahar thinks that the app is almost ready.
- Sahar mentioned that regarding the meeting for WP T2 deliverables, she has sent a poll to the partners and based on replies **she plans to schedule the meeting sometime in beginning of March.**

**Action: 1. Sahar plans to organize WP T2 deliverable meeting in first week of March.**

#### T2 subgroup for HMF, UK

- Gautam updated that they had done sub-WP T2 HMF meeting the previous week where he explained his further analysis and results with the data. Gautam presented results of different modelling approaches with the data in the meeting. Gautam updated that for various modelling algorithms, he



had to process the sensor to a transformed format for it to be give to the algorithm subsequently. Gautam also shared processed dataset of HMF with some of the partners in previous week.

- **Gautam mentioned that as next step, he is thinking of having a User Interface which can be used to give prediction outputs of the model to a user based on a given set of input data provided by the user.** The prediction output can be given to user in terms of maximum duration or maximum distance the journey can be made based on given set of input parameters. **Gautam plans to discuss with Whysor also on how easily or quickly such functionality can be integrated into Whysor platform for a given machine learning model.**
- **Gautam also mentions that he plans to have a separate meeting with other analytics partners such as Xavier and James and would discuss the modelling algorithm in more detail with them, so that they can also test it and they would suggest or discuss if the model can be further improved.**
- Kate asks Gautam how easy or difficult he thinks this UI should be from data or Whysor perspective. Gautam mentions that based on the data we have prepared a model, now we need to see from a UI perspective how soon it can be done. **Gautam mentions that he wants to discuss it with Tom on how much efforts it would need to be integrated on Whysor platform, or if they can have it as a standalone application as a Proof of Concept.**
- James suggested that to have a proof of concept, if integration with Whysor would take efforts, we can have a Flask app installed on Heroku platform. Gautam agreed that he was also thinking on similar lines. James asked Gautam if he can send him the accuracies of the model and he can also support in building the app. **Gautam agreed and said that he would anyway schedule a separate meeting with James and Xavier in a couple of days to discuss the model performance and its usability.**
- Kate asked Gautam if he is planning to contact Daniel. Gautam said that James was to approach Daniel but Gautam has not heard back anything on this from James yet. James said that he hasn't spoken to Daniel as yet and Daniel's official email doesn't work anymore **but he would share Daniel's personal email with Gautam.**
- Kate asked Gautam if he thinks we should involve Natalie in WP T2 meetings for HMF. **Gautam says that we can engage Natalie but prior to that he would like to discuss the model with analytics partners in the meeting in couple of days and have work on UI going.**

**Action: 1. Gautam to explore and discuss building UI for prediction for users based on running models using given set of input data and returning the results back to users with Whysor.**

**2. Gautam to schedule a meeting with analytics partners James and Xavier for performance analysis of algorithm model and its usefulness.**

**3. James to share contact of Daniel Kelly with Gautam.**

T2 subgroup for Yumchop, UK

- Sahar updated that she didn't do any further data analysis for Yamchop as she is focussing on deliverables now based on Ram's advice. Sahar is leaving the project on 2 April and she found a new job in another university so she updated that **she is just focusing at the moment on deliverables to check everything is delivered and everything is doing fine.**
- Kate asked Sahar if she can give us a summary on the deliverables that you are working on? Sahar replied that she has already developed a spreadsheet. It's an excel file and she will put it in the

SharePoint. It all about deliverables of the work packages. It's part of the application form that she put it in the Excel file. She also showed it to Ram and Tahmina and they were fine with it and **she will share it with everyone who wants it.**

- Sahar showed the excel file listing deliverables for work packages. Sahar updated the current status of various deliverables of the work packages and mail exchanges she did with Gael and Imke for deliverables. James suggested we could rename the document of metadata requirements and could be used for one deliverable. James highlighted that it was because of this reason, he requested to call for WP T2 deliverable meeting and it could be more clearly discussed in WP T2 deliverable meeting.
- Sahar updated on statuses of various deliverables as listed in her excel file in more detail.
- Kate asked Sahar when she plans to organize WP T2 deliverable meeting. **Sahar replies she plans for beginning of March. Kate asks Sahar to send an invite this week itself.**
- Xavier asked if Sahar is not working for Yumchop sub-WP T2 meeting, then who would take care of it? James asked Sahar if she heard back from Abi on frosting cycle timings. Sahar replied she did not hear anything. James mentioned that he can try writing some software himself for this.
- Kate asked who can work on Yumchop data analytics. **Gautam mentions that he could try doing Yumchop data analysis and others could also support if they have any idea. Gautam and James discuss they could try SPC analysis for Yumchop. James also highlighted we are waiting to hear back from Abi on frosting cycle timings and James is also planning for writing a script on this. Kate suggested we can have a meeting on Yumchop data analytics after we have a meeting on HMF data analytics, as then we would need to travel to Colchester.**

**Action: 1. Sahar to complete work on deliverables for work packages.**

**2. Sahar to share excel file of deliverables with the sub-group.**

**3. Gautam to take over from Sahar and perform data analysis work on Yumchop data, along with support from other analytic partners James and Xavier.**

T2 subgroup for Musgrave, NI

- James updated that with more data coming in next days, he hopes to have a better-quality dataset for Musgrave pilot test in coming days. His focus so far has been to first get more reliable and high-quality data from the Musgrave pilot test and with batteries replacement done and sensor location changed, he hopes to have them now in next couple of weeks.
- **He hopes to perform some analysis on that data, like based on scripts he already prepared for Yumchop pilot test and also SPC based analysis. We could also see how external parameters such as temperature affect the temperature inside and cooling profile.** But before that he plans to have dataset prepared in couple of weeks and hopes we have some sunny days to get good data.

- **James also updated that he is going on annual leave in week of 13 March but hopes to have a brainstorming meeting for Musgrave data analytics before the RSC meeting in Colchester.**

**Action: 1. James hopes to perform some data analysis work on Musgrave data obtained through repositioned sensors.**

**2. James to have brainstorming session for Musgrave data before RSC meeting.**

T2 subgroup for WD Meats (NI) & BFM (ROI)

- **Xavier updated that he is planning on arranging a meeting, perhaps ahead of another visit to Burns Farm meets, to see if we can a brief meeting to talk about some of the weights that they already recorded.** He said although the priority is to visit again and get the logger working fine, but it wouldn't be bad to have a meeting to discuss more about weights and things that we can do from now on.
- Besides that, there were no updates other than the updates of WP T1 that were already mentioned before.

**Action: 1. Xavier planning on arranging a meeting with BFM, to talk about weight measurements, before their next visit.**

T2 subgroup for Raman, France

- **Omar updated that he will have a meeting with Jean-Charles tomorrow to get and discuss further updates on this.**
- Other than this, Omar said that he has no new updates. Only after tomorrow's meeting, he could provide more updates.

**Action: 1. Omar to meet and discuss with Jean-Charles on data analysis work and opportunities for Raman pilot test.**

WPT3

- **Xavier updated that he did some work on on Delivery 2.1, though he needs to put a lot more work on it and will be predating this before Colchester meeting.** Xavier said Tamiris also did some work on this.
- Xavier said apart from this, there was some work regarding volunteer hosted for which **Xavier was filling the application at the moment.** So we're going to try to see if we can host volunteer to help on this Activity 2.1. The idea is to do some further analysis and literature review.
- James updated that **on Deliverable 2.1**, he was not pushing Tamir for too much work, but she did say that she intends to also continue having a look at that in March. So hopefully between **James and Tamiris, they would try to get some tangible progress on work before the RSC meeting.**
- On quality survey, James said that we had our second interview with Robert Gallagher of Musgrave. We've had two interviews so far. **We've got Cahill Burns from BFM and Marco Clinker from Biogros booked in. Marco responded for 14 March. Mark Logan also showed inclination to participate. So we should have five interviews in total. James aid that he was hoping to get Abi to do an interview as well, that would make total interviews six and then the only missing pilot partner would be Picnic.**

With respect to Marco, James was not sure how his English is going to be. James spoke to Trevor about this and they thought of having a native German speaker in the interview as interlocuter. As they couldn't find someone available in University, **James is planning to ask Imke to join the meeting and be able to help with any small translations required during the meeting. James asked Imke but haven't heard back from her yet, but he would invite her anyway for the meeting on 14<sup>th</sup> March.** James provided **Emmett**, Trevor's PhD student, with Lakshmi's contact details and he's talking about coordinating with her on the literature review required for the surveys. He believes there would be quite a big overlap between the qualitative literature review and the quantitative literature review since they're both really pertaining to the same area of food waste on IoT. **So he's hoping to collaborate with Lakshmi on the literature review.** James was not sure if he's made contact with her, but **James would check in with him before the end of the week.**

- **Kate updated that she spoke to Abi on her visit to UoB, and she agreed for participating for survey. But Kate said that Abi would do it in April** as they were busy currently. James said that Trevor is keen to start progress on this asap and we should at least start in April.

**Action: 1. Xavier to work further on Deliverable 2.1 before RSC meeting.**

**2. James and Tamiris to work further to get tangible progress on Deliverable 2.1.**

**3. James and Kate - Survey interviews for Mark, Cahil and Abi.**

**4. James to followup with Emmett on progress on literature review.**

WP LT

Xavier mentioned that there were no further updates on this package.

WP M

- Kate said that she would like to remind **partners to save in the SharePoint their presentations from Dublin (if they haven't done it) as Kate will be now preparing for the next report 4.2.**
- Kate prepared for on the spot check audit, that took place in Luton last week, on 23. They had an auditor and they hosted him for half a day. It was a thorough audit and UoB are still looking for some paperwork for him because Kate said he was not fully satisfied. Kate said that among partners, only UCD spot audit is missing. Kate said that UCD would need to have one on spot audit with this report 4.2. **Kate said she hopes to complete the audit of report 4.1 as soon as the auditor is satisfied with everything. He is currently reviewing everything. Then Kate plans to do report 4.2 for the project.** So a lot of reporting at the moment on Kate's desk.
- Kate said that they are discussing the closure dates. Kate got an email from our officer Mayela, at joint secretariat. She is asking us for a physical meeting with Ram, Yan and Kate on the closure of the project. So around April we would need to have a good understanding of the different deliverables at Colchester.
- Meeting at Colchester is happening on 22 and 23 March. The agenda and practicalities have been sent out. Kate asked the partners regarding which colleagues are planning to come to attend this meeting? Gautam said that he would discuss it in MTU with Gerard and Pat and would let her know in some time. Xavier mentioned that as of then, only he plans to come. Omar said that from UoN he and Ali would be coming. From Ulster, James mentioned that himself, Joan, Pradeep, possibly Trevor and less possibly William will be travelling.

- Kate updated that contracts for Joy and Paula are still stuck at HR and Dean offices at UoB. There is slowness in approving them, so **Yan and Kate are chasing for them, but its taking time. Kate is also preparing the list of deliverables for the meeting with the Reamit officer.**
- On minutes from Dublin, Kate said that she was missing minutes from Sasha. Sahar sent her the minutes yesterday, but Kate asked Sahar to send the minutes in the word format rather than pictures of slides. **Sahar agreed that she will send minutes in word format in next two days.** Kate also said that she misses minutes from subgroup meeting on the 14 December from Sahar. **Sahar agreed that she would send it by the end of next week.**
- On Reamit 2.0 continuation, Kate said that there was a meeting with various people about different possibilities. Ram wants to go in the direction of providing ownership of sensors to ActionSense. But there are ideas for developing some applications inspired by Reamit. Kate said that today there is a training by Northwest Europe in the afternoon on small projects. She asked Omar if he is attending? Omar replied he tried for registering for it, but the registration was closed before he could register for it.
- Kate said that **Ram would welcomes short description of project ideas/Project proposals to be presented at Colchester. So if you have any idea, you can present it or share it, get feedback, for kind of follow up projects.**
- Kate updated that yesterday at the event, when she met with Abi, she also met a lady from her university who is doing work on harmonizing standards and policies on food. So she thought a project around Human Milk Foundation, regarding harmonization of policies around in this area, could be very interesting. Tamiris is not here, but **Kate said she would prepare a little summary** for her as she was interested in taking this further.
- **Xavier said that he will follow up on having on-the-spot audit check at UCD.**
- Kate said contrary to some of partners, they did have a more thorough audit. The auditors sampled transactions throughout the entire Reamit project. Kate mentioned that she was expecting worse than the audit that happened but it wasn't that bad. The auditor who was sent didn't know Reamit at all and was a junior auditor. They sent somebody who was just closely available in an office nearby London. He knew nothing about Reamit project. He was interested only in seeing the audit trial for the different cost items. We couldn't find one. We are not sure what it is. Finance doesn't know either. So we are trying to sort this one out. We hope we can do it for £500. The auditor also wanted to see the big data hub. So Sahar helped us arrange the visit. This time it was urgent, so the security let us in. So we took the auditor to show him the big data hub. Because the volume of the transaction was about £10,000.

**Action: 1. Project partners to upload their presentations of previous RSC meeting of Dublin on sharepoint.**

**2. Kate to start preparing project report 4.2.**

**3. Kate to complete audit report for project report 4.1.**

**4. Xavier to follow up at UCD for on the spot audit check.**

**5. Kate and Yan to follow up at UoB for finalizing contracts of Paula and Joy.**

**5. Sahar to send her RSC meeting notes of January in word format to Kate.**

**6. Sahar to send meeting notes of sub group meeting of 14 Dec 2022 to Kate.**

**7. Kate to draft a little summary on harmonization of policies around HMF work, as a further work building upon Reamit project, and share with Tamiris as she is interested in it.**

WP C

- Sasha was on leave so no updates on WP Communication were discussed.

**Next meeting: Monday, 13/03/2023 at 9 am.**

## REAMIT sub-group meeting notes, 13/03/2023

Lee Johnson is a new post doc at Ulster university. Lee introduced herself, mentioning that her background is more user experience (IUX). The team welcomed Lee and thanked her for joining the meeting.

### WPT1

#### UoN

- The team has completed stage three of the pilot test for Raman in the field and is finalizing deliverables for 3.1, 3.2 and 3.3, which will be uploaded to the SharePoint at the end of the week. Also, a video was created by UoN and will be presented in RSC meeting in London. There is also an idea being worked on with Ulster University, James, but it is uncertain if it will be incorporated into the current project phase. This idea was the incorporation of a Raspberry pi (replacing the laptop in the portable Raman system) which offers remote controlling of the Raman system from any desktop using Wifi. In other words, this technology, if it works, will render the Raman system an IOT compliant technology.

#### WD meats

- James provided an update on their work with sensors in refrigerators. They have moved the sensors to monitor a different area of the refrigerator. James received consistent data set for two vans, with a third van still to return from having its engine rebuilt. Once the third van returns, James will analyze the new data set. James plan to present the new data set next week.
- The freezer run is reporting a significant improvement from before.
- Caroline intends to prepare some of the samples for WD to help benchmark their machine.
- The research manager of WD wants to get more confidence instilled before he fully trusts the installed system.
- They are going to give WD some of their material.
- James will work with WD to understand what sort of bacteria is present.

#### Kate

**Kate:** requested a good summary of all work done by all the partners (in other words deliverable 3.3 (Pilot story telling) before the RSC meeting in London. To be done Wednesday 15/03/2023

- Kate will bring the Freshdetect sensor to Colchester and give it to Omar
- Human milk foundation. Nothing is really happening there. RAM sent an e-mail asking Natalie what she would like to do with the sensors, which ownership route she would like to follow. That was two weeks ago, but we haven't heard anything back from her.
- Yum Chup. Kate had a presentation on aware project where she met Abby. And then they had an exchange, and decide to install one sensor in vending machine on 24th of April.

- Abby would like to install a vending machine at the University of Bedfordshire. Kate was also kind of assisting with that, contacting different people and they're not very interested now. They see it as a competition as Abby is trying different doors.

#### **Burns Farm Meats**

- Xavier has to contact Burns Farm meat and ask whether they be interested to continue having the sensors after the end of the project and and paying for them.
- **Xavier:** Maybe introduce the eagle logger in April and see if it is possible to use the sensor with Burns Farm meat

#### **WPT2**

##### **Sahar – BED Server.**

- BED server was fixed
- Working on deliverable 5.1 (Finished)
- Also working on deliverable 4.1 (Finished)
- Deliverable User manual (Finished)
- Deliverable 7.1 and 7.2 (Debora already finished this deliverable)
- Make a new document regarding a user manual for integrated IoT big data analytics decision support technology – under development
- all above deliverable are already in the share point

##### **HMF – Gautam**

- Xavier, James and Gautam discussed the performance of the model and they can go forward with the model (good accuracy)
- Future work: create an interface and uploaded to Whysor cloud.

##### **Yumshop**

- Ram asked Tamiris to do an LCA without just an assumption of food waste, but rather food waste with some backing: using number of alerts sent to sort of quantify how much food waste is actually potentially being saved by the alerting system. So, James developed a script which actually sent alerts and then assume that they actually actioned on those alerts and there was no food lost.

##### **UoN**

- No updates. The meeting with Synx will be in two days after the sub-group meetings

##### **Levstone APP**



- No feedback on the application yet.
- Kate asked if Lee can have a look on the app and get her feedback as she has the knowledge in user experience (IUX)

### WPT3

- **Xavier** has no updates. Worked on the deliverable 2.1
- Action for **Kate**: Organize a meeting with Abi (1<sup>st</sup> week of April)
- No report forms Musgrave. **James** will check
- **James**: For market readiness report, we are doing osterwalder canvases for for each of the pilot companies, just as a as a business model overview of exactly what goes on. I filled out a few of those and actually spoke to Amit then about filling out the rest because he's conducting these pilot interviews and he's also doing some background research in the companies before he performs interviews.
- **James** noticed that the wording on one of the important questions on the quantitative survey was wrong.
- **James** will communicate with Yan regarding the questionnaire.
- **Kate**: need to reimburse the guided tour in Guinness.
- **Kate**: On-spot audit is still in Bedford
- **Kate**: updated Agenda for Colchester; Gael will be attending online (passport issues). Sasha need to write an email to RAM (for Gael case), also for Lee
- **Kate**: New contracts for Joy and Paula (paperworks are going ahead)
- **Kate**: Each partner needs to work on the final report to start the: project Progress report 5.1.
- **Kate**: Received minutes from Dublin and finalized it
- **Omar**: Ali and Omar will leave before the RSC London finishes (due to changes in the Agenda)

### WPC

- Sasha asked Kate on how to present (the form) the deliverables (**Kate**: write an email to the secretariat or try to make it a PPT)
- Kate needs complete information on the social media communication in this deliverable throughout the whole project to present to the funder on 5<sup>th</sup> of May.
- **Sasha**: Newsletter of April (final newsletter for the project). *Requested partners to send updates to create the last newsletter (video from UoN, Colchester meeting, future ideas from REAMIT....)*
- **Sasha**: will present the legacy of REAMIT, also will show on a video (showing the timeline present on the REAMIT Website)
- **Sasha**: Finalize the infographic (have questions for James and Kate). **James**: **Sasha** can use the information present in 3.2 deliverable to finalize the infographic. **Kate**: **Sasha** can extract the information from EMS to complete categorizing stakeholders' type. **Sasha and Kate** will have a separate meeting to discuss the latter.
- **Sasha is working with Ram** on distributing the REAMIT documentaries along several TV channels
- **Sasha**: Journal articles are also online
- **Sasha**: One final email (farewell message) in June will be sent to all partners

**Next REAMIT sub-group meeting will be on 29/03/2023**

## REAMIT sub-group meeting notes, 29/03/2023

Attended by Katarzyna Pelc, Sahar Ahmadzadeh, Joy Eze, James Gillespie, Xavier Cama, Gautam Samriya, Sasha Bennett and Omar Dib

### WPT1 Pilot Tests

- James sent an email to Kate and Sahar highlighting outstanding WPT1 deliverables which need input from the Bedfordshire team. Sahar is leaving the university at the end of the week (31<sup>st</sup> March) so Kate is waiting to see if she can contribute to the deliverable before she departs. **Action: Kate will complete the deliverable if Sahar is unable to finish it.**
- Kate has emailed Natalie to ask for a meeting to present physically at HMF the levstone app and results of data analytics performed by Gautam. Tamiris would also like to present follow up project ideas to HMF. The plan for the ownership of the sensors and how we will close the cooperation with REAMIT will also be discussed. Kate invited any other partners interested in contributing to attend. James noted that Joan would be keen to attend the meeting but may require online facilitation. Kate proposes a 2-3 hour meeting, partially physical and partially online. Kate asked James to check Joan's availability – and if she wants to have it online it will not be a problem.
- For Yumchop, the sensor was installed in the vending machine at Victoria coach station in London on Friday, 24 March. However, there was an issue with connectivity. The sensor came online 2 streets away but could not connect / upload in the station itself (or while stood outside it). James called Marco (from Whysor) to attempt debugging. There may be a dead zone around London Victoria coach station or there may be an issue with a nearby phone mast. James noted that there is an issue with O2 close to London Victoria and thinks that 1NCE (the sim supplier) uses O2. The 4G dongle that Michael from Yumchop uses does work. James has left the logger in the vending machine and will monitor to see if it comes online. Marco suggested that the antenna could be changed in the logger to a more powerful one as a potential solution to get it online. **Action: James will check with 1NCE / the O2 business team to see if they know if there are any issues with the LTE-M network or if London Victoria is known as a dead zone.**
- Kate / Sasha will check with Ram if he wants to publish a story on this work in the upcoming newsletter. Kate thinks that it would be good to show our continued effort but that there are external factors outside of the projects control to get equipment working. It is significant that the project has deployed equipment at a major transport hub in London. Photographs were captured from the installation which could be used. James will upload the photos to the sharepoint. **Action: Kate / Sasha will check with Ram if he wants to publish a story on this work in the upcoming newsletter**
- With the closure of Glen Affric pilot test, Sasha has posted the equipment back to Whysor. This has not been received yet, and because the university mail was used, no tracking number was provided. However, she has been assured that if the equipment goes undelivered it will be returned back to NTU.

- For the video produced by UoN, Omar will need some of the logos removed before it is uploaded anywhere online (for example Eurocar, since they are not part of the project.) Sasha is to assist with this task this week, which will involve tracked blur motion. James mentioned it can be done in premier pro. Sasha plans to publish the newsletter before Easter.

## WPT2

- Kate will take over the management of this work package once Sahar leaves.
- Whysor has completed the user manual for the dashboard (deliverable) in English and has sent it to Kate. Kate proposes the group takes a look at the manual and discuss it at the next meeting if any improvements need made.
- Kate talked to Pratheep (UU) at Colchester about the mobile app. Pratheep said he could show some examples of his students apps and Ram agreed that this was okay. Kate asked NTU to grant Pratheep access to the sharepoint so these can be uploaded.
- **Actions: each partner to check the dashboard manual and example apps from Pratheep.**
- Kate would like to work with Joy for deliverables for WPT2 that Bed are responsible for. Sahar has started to develop these but they need expanded on. 4.1, 5.1 needs examined. 5.2 needs a report per year which will need created. Davinder has produced 5.3 and 5.4. **Action: Kate to have a meeting with Joy this week to start looking at these deliverables.**
- At the RSC meeting, Davinder suggested that he would like to receive feedback on the app from partners before it was presented to any clients. Kate will ask Davinder if he would like to have a smaller internal meeting with REAMIT partners first and try to organise this for this Friday (31 March) for 1 hour. Kate would also like to see what Gautam has prepared before it is presented to Natalie. Sasha, James, and Xavier will try to join this meeting. Leigh (UU) will also be invited.
- Sahar confirmed that ICT has rectified the big data server issue. It is now working fine. She no longer has access to her PC and does not think she will be able to improve the WPT1 documentation before she leaves.
- Sahar's device which Davinder loaned her will no longer turn on. She will message him and ask if he has any advice. She will leave it at reception in Bed office when she has finished testing the app.
- Gautam's last day of work is likely to be the second week of April.

## WPT3

- James is hoping to organise a wider WPT3 meeting with partners, ideally before Easter although different universities take this at different times. There is quite some work to complete for the Market Readiness Report deliverable and the business prospectus deliverable before the end of the project. James wants to see who else is willing to contribute to the MRL report. Ram has agreed to help with the business prospectus. Kate suggests we can involve Images & Reseaux as well.
- **Action: Kate to email Abi to follow up on the qualitative interview in the first week of April.**

## WPC

- The April newsletter is being constructed which will be the final major newsletter for the project. After this, there is one final newsletter planned for the end of June. If Sasha has left her job by then, she will ensure Usha receives the mailchimp details so that she can use the mailing list and distribute the final newsletter.
- James does not have any updates to include in the April newsletter. Any updates on his pilots will be at least a month away. If Ram agrees, the Yumchop installation could be published. James would have liked to include FreshDetect trial but would need a more time so that results can be validated. He will work with Usha on the final update newsletter to include final wrap up updates on the pilots.
- Kate will write an article on the event she attended promoting women in agri-food supply-chains for the newsletter. Kate will check with Ram if an article can be included about the meeting on the Actuate project. If Omar gets permission, an article can be provided on the new project they have received funding for. An article on Omar's video could also be included – Sasha plans to include this already. She also intends to include an article on the mobile app. Kate wonders if there is an update on the dashboard which could also be supplied – she will check the documentation provided by Imke.
- If Usha and Ram are happy to wait until mid-April, Omar's update on the future funded project may be able to be included. Sasha will have to check.
- Ram is speaking today at a seminar which can also be included. The second half of the journey of REAMIT will also be included.
- Sasha is working on a new infographic video which will be uploaded to youtube.
- A new section on the website has been made called meet the team – as suggested by Gautam. It will be sent to partners for feedback to check if they give permission for it to be published before it goes online. Because there are many members involved in REAMIT, Sasha has reduced it to name, organisation, and role (no bios).
- The REAMIT officer will be looking at the website. Action for Sasha to include the Colchester event, any events attended by partners, etc. Kate asked Sasha to include a picture from the Colchester event. Sasha said she can add it to the news section of the website along with a brief update on what was discussed.
- Sasha is collating a report on all REAMIT events which have occurred for the duration of the project (networking events, symposiums, RAC's etc that they have organised) for deliverable 4.1 (communications). Sasha will use the brief updates from the newsletters as the report on the RSC for that period for this deliverable.

#### **WPLT**

- Kate had a meeting in Colchester on 24 March with Ram and his REAMIT spinout Actuate funded by university of Essex innovation fund (£8000). It was a kick-off meeting with 2 other partners on what the project should aim to deliver.
- On 19 April Kate will meet with the dean of the business school at Beds who presented the idea of looking for follow up projects inspired by REAMIT. Yan and a colleague from Innovation and Enterprise at Bed has also been invited.
- In Colchester, there was a presentation about opportunities from Horizon Europe program. Ram is very keen to pursue this, and Shane is willing to support. There is likely to be a meeting around this. There is a call for **Coordination and Support Action**, and the idea for this type of a project would be

to disseminate the REAMIT approach and how it could be implemented on the ground, for example in other parts of Europe (e.g. south Europe).

- Tamiris also has ideas involving Human milk banks, and is keen to organise follow up meetings on this.
- Sahar asked if there are opportunities for external partners in writing future project proposals based on the REAMIT project. Kate said you would need to talk to those leading on proposals: Ram, Tamiris, Joan, James.

## WPM

- On the spot audit at Bed is still ongoing. Last week Kate received the missing information from payroll. Kate hopes the audit will be finished this week. After this, report 4.1 can be submitted to the funder.
- Most partners have completed activity report 4.2 (July-Dec 22). UCD, Levstone, MTU, Senx, and Ulster are still working on this. Kate hopes this work can be completed soon. James asked if working on it meant the FLC's were still outstanding at these institutions. Kate confirmed that this is with the auditors yes, as these reports have not been certified.
- Fionnuala contacted Kate informing that there is a new employee doing financial reporting at UCD. Kate has granted her the necessary permissions. Xavier may have to help her with the EMS system.
- UCD and NTU still need to be audited on the spot. It took over 1 month at Bed. If there is a new employee at UCD, Kate expects challenges and delays in this regard. Daniel at NTU has confirmed the on-the-spot audit will occur on 3 May.
- Final report 5.1 still needs to be completed. We still do not have clarity on the deadlines for the project. At Bedfordshire, they're considering the **end of May**. Audits completed in the first half of June so that there is 1 month left to close everything. The meeting with the NWE officer is 24 May in Luton and she is coming with another evaluation officer. Ram and Yan will be present with Kate, and Joan also wants to attend. There is a space for 1-2 other partners if there is anyone else who wants to join – especially if there are institutions who are going to be affected by the staff costing issue that will come with early closure. If the project closes at the end of May, staff costs for June and July would not be claimed.
- One suggestion is certifying staff costs up front. Joan has said that it would not happen at Ulster, but that doesn't mean it wouldn't happen at other institutions. Ulster's auditor will not certify costs which have not left the Ulster bank account yet.
- The other NWE project that Kate has heard from is closing project activities at end of June, and their submission of the final report is not due until 23 September.
- We have been granted a 2-week period from 9 July to finalise submission, however, Kate will no longer be in employment at this time. Yan therefore is insisting that the closure documentation is completed before she leaves.
- One other option is if each partner can guarantee their FLC can be completed on 1 July so that June payslips are certified. However, knowing how partners have previously performed, Yan is concerned that delays could occur. Kate will again bring these issues back to Ram and Yan to seek further clarity.
- Yan and Kate are going to meet with the finance officer at Bed for the closure of the project. After this meeting, a meeting with partners will be had for closure deadlines.
- There is World Food Summit happening in Italy on 9-10 May 2023. It is outside NWE eligible area, but BED is checking if they can use the REAMIT budget to attend the event.

- REAMIT performance paperwork across all work packages needs completed. Yan would like to meet with some partners to help complete it. Joan will also attend this meeting.
- Kate has requested all partners to send the minutes from Colchester by the end of this week (31/03).

**Next meeting: 17/04/2023.**



## REAMIT sub-group meeting notes, 03/05/2023

Attended by Katarzyna Pelc, James Gillespie, Sasha Bennett, Omar Dib, Joy Eze, Leigh Johnston, Paula Borowska, and Xavier Cama.

### WPT1 Pilot Tests

#### Raman Spectroscopy, France

- No updates since last meeting from UoN. They were finalising the final report on EMS, however.
- James explained that he had been working on a small system for recording Raman. It was based on a Raspberry Pi 4 with a GSM shield.
  - James was liaising with Jean-Charles: a Python library had been implemented for remote scanning. They were also hoping to get a local instance of the Warp-10 spawn up on the Raspberry Pi too.
  - The system would have a front-end which by just pressing a button one would be able to see the status of a Raman scan based on the model that Omar made earlier in the year (if newer models, they could also be included as they get generated) – calculations made on the Raspberry Pi.
  - James and Omar were planning on having a meeting in Nantes to implement the system and do some field testing in May/June.

#### Burns Farm Meats (BFM), Ireland

- James had built - and completed - a sensor for the humidity validation to deploy in Burns Farm Meats (RH readings had been always very high at BFM).
  - The sensor was based on an ESP32 (microcontroller; has a Wi-Fi chip on it as well).
  - It runs on a MQTT server – hopefully, the sensor could be connected to BFM's Wi-Fi and upload data to the server successfully.
  - In case there were Wi-Fi issues, the sensor also had an e-ink screen which allowed for Cathal and Diarmaid to check the parameters visually.
  - The external probe – SHT20, recovered by a foam material, had been reported as valid for this type of use case in the literature, and should give truer humidity values than the ELT-2 as lacking this feature.
  - The battery was fully rechargeable by connecting it via USB-C.
  - Encased in an IP-65 fully rated moisture casing.
- James and Xavier were waiting on Cathal to get back to them for a visit at their premises to install the newly build sensor.

#### 3D Fluorescence trial, NI

- James had been working on the building of sampling containers (3D printed) which allowed for keeping the Fresh Detect device locked in position and distance while acquiring scan readings.

- The idea of the trial was to generate a model that could detect spoilage over time by tracking riboflavin. PH would be tracked with a pH meter at the same time (to link pH degradation data with the Fresh Detect scans).
- At UU there was the possibility of using a robotic manipulator to automate the Fresh Detect scans so that a large sample and a robust model could be obtained.
- James showed some preliminary results of the riboflavin degradation over time observed in tests carried out to date.

WD Meats, Musgrave and Andy Keery pilots in NI

- There were no updates to report.

HMF, UK

- There had been a meeting on 2 May 2023 (the previous day). Kate explained that the meeting was positive overall: show what REAMIT has done in the project, propose avenues for possible collaborations. However, Natalie, a key person for this, was not able to attend the meeting.
  - Everything that needed to be covered was talked about though, and if HMF was interested in teaming up in the future they now knew some options on how to do it. Also, Davinder stayed for a while longer with Mike talking about the Bluemaestro sensors.

Yumchop, UK

- Deliverables: Kate explained that she had finished the deliverable 3.1 work related to Yumchop. As for D3.2, it was quite technical and Kate requested help from James for some questions she had about it.
- As for the pilot test, Kate had not heard from Abi recently. Kate was waiting for her reply on whether she would like to move the sensor from the vending machine to a van transporting food from Yumchop's food factory to Sainsbury supermarkets.
  - James added that the Eagle logger, that was not working properly in the vending machine, could certainly be fitted in a van and given a similar set up as Musgrave (e.g., trip detection).
- Just before Easter, the qualitative study interview lead by UU was carried out with Abi. Abi explained that they were keen on collaborating with REAMIT partners in the future, mainly for developing new project proposals. For instance, they had attempted to get funding from an Innovative UK call around the use of Blockchain technology in the past, but it was rejected. A similar idea could be brought up again and apply for funding.

Kate was working on a paper about the duality of technology and impact on organisations (in this case: HMF and Yumchop), and she was hoping to be able to talk to Natalie at some point in June to get the missing data.

Related to the impact on organisations, Kate had been reviewing a theory that talked about the organisation aspect: how the technology fits in an organisation, with their structure, mission, if the organisation is ready to implement it; and the human aspect, i.e., how people see this technology, if they are comfortable, happy,

if it is helping them. **Kate asked to let her know if partners knew about other theories on organisation impact.**

## WPT2

- James and Joy had met to structure out the annual reports (for D5.2) and Joy was leading on this work.
- James was hoping that Gautam could send more information about the modelling for HMF, and maybe also for work he carried out for other pilot tests, necessary for the deliverable regarding data analysis as the documentation James had received was not comprehensive. He had sent Gautam an email to see if he could provide more detail.
- Kate was going to talk To Ram, Yan and Tahmina on how to distribute the work on deliverables.

### **Deliverables:**

- D4.1 (interface) -> James explained that this deliverable needed some input from Whysor, but it would be recommended to ask them specific questions rather than ask them to complete the deliverable from scratch. James had prepared a template expanding on Sahar's work, which was very limited. James would suggest and include some bullet points needed for deliverable to be completed.
  - There might be some notes about this deliverable in the Essex-RAC meeting minutes document. Sasha to send the Essex-RAC minutes about WPT2 section.
  - James would send the template to Kate in a couple of days with suggested headings.
- D4.2 -> This had been completed by Whysor. Maybe some information could also go as introduction to D4.1.
- D5.1 (Big data platform) -> As a remark, maybe it did not have to be necessarily a report. Kate explained that Ram had also mentioned that not all of them had to be in the format of a report/Word document.
  - However, Xavier explained that Sahar had a document in Sharepoint regarding 5.1. It consisted of screenshots and it needed some work to make it presentable.
  - James suggested some headings for this deliverable - Xavier commented/wrote these headings down on the document in Sharepoint.
- Kate suggested to distribute the deliverables among sub-group members: James, Xavier and Omar. One person would be responsible of making sure their assigned deliverable had all of the information necessary.
- Kate would take the creation of interface deliverable and liaise with Whysor.
- Joy was working on deliverable 5.2 reports on big data platform.
- Xavier would take care of D5.1.
- D5.3 -> This one would be led by Davinder.
- D5.4 (User manual) -> This was the main deliverable that Sahar delivered on.
- D7.1 -> Davinder
- D7.2 -> Davinder

- D8.1 (deployment of the integrated IoT/Big Data/analytics) -> Possible overlap with 5.1.
  - Joy mentioned that it had been previously discussed that Gautam's paper could be used to inform this deliverable. Although James pointed out that Gautam's paper was better used for 8.2.
  - Kate suggested this deliverable could consist of the PowerPoint presentations that data analytic partners had made in the past.
  - **There was no clarity for 8.1.**
- James would take care of 8.2.
- Kate was going to talk to Ram about all of this distribution of work and ask him to attend the next sub-group meeting, or alternatively have a separate meeting exclusively for deliverables.

#### **Davinder's presentation during HMF meeting**

- Kate explained that Davinder did not really take Leigh's suggestions into consideration.
- James mentioned that Davinder said, during his presentation, that the user interface did not look great.
- Kate had hoped that we had a simple application for HMF; Kate thought this was not the appropriate application for them.
- Kate explained that Davinder wanted to keep the contact with HMF and have another meeting in the near future. Kate extended the invitation to Leigh for this meeting.
- The team regretted this meeting with HMF, trying to determine their needs for the app, had not happened well before in the past.
- Newer updates were expected following this new meeting with HMF and Davinder.

#### **WPT3**

- Xavier explained that he had been doing some work on D2.1 for T3.
- Xavier reminded the team about that attempt from the UCD team to recruit a volunteer through the programme: IVY. Xavier had talked to Fionnuala about this, and it was concluded that the economic aid granted for this was very little to cover for accommodation in Ireland. As a result, Fionnuala proposed to recruit research assistants in the project from the UCD REAMIT budget and advertised the positions to masters students in UCD.
  - Xavier had already interviewed one student so far, and he would be interviewing two more that day.
  - James asked on the number of RA positions. Xavier did not know for sure but he suspected that there would be 2 and that they would be hourly paid.
- James explained that Marc Logan (WD Meats) was interviewed for the qualitative study led by Emmet (UU).
- Ram had originally proposed to have interviews with all pilot test companies. However, PICNIC did not commit to an interview. In total, there had been 6 REAMIT companies interviewed plus a fruit and vegetable (non-REAMIT) supplier that Trevor (UU) had secured in Northern Ireland.
- Emmet would be analysing the results during the end of May and June. This work would serve for deliverables for T3 as well as a publication.

- James had been working on D3.1 (market readiness). He was hoping to get help from other members of the team; Tamiris might be able to give a bit of a help for this. James showed the work he had done so far to the team. James asked Kate and maybe Whysor to help complement sections about their pilot test companies Osterwalder (canvass/SWOT analysis).
  - Information about data analytics were needed to supplement the deliverable.
  - Other sections to work on were lessons learned, value proposition.
  - James had several ideas to improve the deliverable including a bit of a case study on Raman. Some amount of work was required as it was a lengthy deliverable.
  - Kate provided good feedback regarding the document James produced so far. To include Raman and Fresh Detect as well.
  - Kate agreed to help fill out the canvass. Kate could ask Imke as well about PICNIC.
- James explained he was planning on having a meeting for T3 in the following weeks future.

#### WP M

- Paula had been helping Kate on the reporting in EMS and progress report related to BED.
- Paula had been updating the handbook. There were some minutes missing and she was hoping they would be sent for her to finish it.
- Kate explained that they were preparing for the audit of report 7.2 that was going to take place soon (11 May). Reminder for UCD to complete theirs before 11 May.
- Sasha to send the minutes of Colchester RAC meeting that same day and latest sub-group meeting notes by the end of the week. Paula would be writing minutes of the HMF meeting the previous day.
- Paula was working on the storytelling for Yumchop as well.
- There was going to be a meeting with the funder, Maelle, on 24 May. Davinder expressed interest; other partners could attend as well.
- Kate was having meetings with Yan and finance on the closure of the project – timesheets, contracts, etc.
- Kate was working on project proposals, for instance KTP.
- Kate would be presenting about REAMIT on 10 May in a London supply chain conference.

#### WP C

- Sasha mentioned she had been making updates on the website:
  - She had included a meet the time section on the website.
  - Sasha received good feedback from the team.
  - Some member's pictures needed updating (they had to send a newer photo). Omar would ask Ali about getting a new picture.
  - Media and publications had a new tab about publications.
  - She had posted a new news article that morning. Mostly about dissemination of the REAMIT project at events.
  - The policy documents had also been updated on the website.
- The last newsletter of the project would be in June and it was going to be a farewell newsletter.

- James mentioned that there would be a few updates to publish in June such as analytics work on HMF from Gautam, Jean-Charles' work on Raman automatization, visit to Burns Farm Meats.
- Kate also had at least three updates for the final newsletter.
- Sasha would talk to Usha about the format of the last newsletter.
- Gautam had leaded on the publication of the article press release and had been published on the MTU website. Sasha would link it to the REAMIT website as external publications.
- The website would now be hosted in GoDaddy until 2027 prolonging exposure of the REAMIT project to the public.
- Kate mentioned that the same cover page could be used for all deliverables such as the one James had produced – which Sasha explained that some changes would be needed as to the format.

**Next meeting: 22 May at 9 am (Dublin/London time)**

## REAMIT sub-group meeting notes, 22/05/2023

Attended by Katarzyna Pelc, James Gillespie, Xavier Cama, Sasha Bennett, Omar Dib, Leigh Johnston and Joy Eze

### WPT1 Pilot Tests

- James and Xavier visited Burns Farm Meats and installed the sensor that James built to monitor temperature and humidity (on the wall of chamber with lower humidity readings). The sensor can send data via Wi-Fi and can be seen using the application. James wants to see if the data can be recorded on Ulster server. Xavier mentioned that they were unable to collect training data to showcase the amount of meat they must train before selling it/putting it in the market as it was not scheduled for their visit. However, during the visit binary sensors were fixed and you can now see if a door is open or closed and monitor this via the dashboard. Depending on the price Burns Farm Meats may be interested in keeping 1-2 sensors along with the dashboard.
- James provided an update relating to real-time spectroscopy analysis for Omar. James presented an example of an easy-to-use application (front-end and back-end) for truck drivers to monitor chicken during cold-chain transportation. When the main button is pressed, a request is sent to the spectrometer, it then scans and presents results back via the user interface by displaying one out of the four classifications/labels previously established (extra fresh, fresh, good and bad) along with a quality gauge (red, amber and green). Still a few bugs to iron out, but almost done, it's a matter of bringing multiple script files together.
- James going to follow up with Mark regarding trim loss data (WD Meats) as he said he would provide more before project ends. However, as previously mentioned there will be no more dry ageing until September.
- James going to follow up with Musgrave and Andy Keery regarding sensors and whether they would be interested in keeping them.

- Kate going to follow up with Yumchop regarding one sensor that did not send data properly in vending machine as she has not heard from them in last three weeks.
- Kate distributed minutes with actions to Human Milk Foundation. However, there has been zero communication by Natalie or Gillian from last meeting. No answers regarding sensors.
- Kate mentioned zero response from Davinder regarding app and Human Milk Foundation.
- Kate doing a paper on how companies use technology and what challenges they have. Ram put forward the idea of getting additional data from companies via interviews (Human Milk Foundation and Yumchop). In the meantime, Kate will use data that has been obtained thus far and do analyses on it before obtaining additional data.
- Omar Participating in a scientific event on Modelling and AI in Science and Technology held in Nantes, France, 5 June. Focus on utilising AI and how it can improve Raman spectroscopy. He will present modal and understand from audience how it can be improved in future.

## **WPT2**

- Kate mentioned that Ram provided a summary saying himself, Yan, Tahmina would be responsible for overseeing all deliverables in WPT2. Tahmina has asked Joy for assistance within WPT2 specifically 5.1 and 5.2 respectively. Davinder working on 5.3, 5.4, 7.1 and 7.2.
- Joy to start this week to finish by end of May/June, there have been delays due to email finalisation.
- Kate looking at deliverable 4.1.
- James looking at deliverable 8.2. Will need input from analytic partners should there be no code available.
- Kate to look at email as Ram or Yan mentioned they were completing deliverable 8.1.

## **WPT3**

- Xavier mentioned that there will potentially be four hourly paid students at UCD to assist with work, there is still paperwork to complete. They could be allocated to other deliverables as opposed to just one. They could assist with MRL (pilot summary) or Business Prospectus for example.
- James attempting to put a document/meeting together for a discussion around how to assist with what work is left for T3.
- James has basic statistics from the quantitative study to assist with a section of the MRL document and this is already being implemented. In addition, James highlighted potential areas of the MRL document that the hourly paid students could assist with.
- James will share MRL document with Kate so she can read through sections regarding SWOT.
- Deliverable 2.1 Xavier mentioned that there is potential for the hourly paid students to assist with it.
- Kate mentioned Ram and Yan could assist Xavier with mapping papers to assist with deliverable 2.1 and the possibility of blockchain technology with IoT.

## **WPM**



- Kate, Yan, Ram and Davinder will attend a meeting in person on 24<sup>th</sup> May for the closure of project and evaluation in person, John and another evaluation officer will attend online.
- Kate has completed paperwork with Paula's help for 4.2 - audit for project records. Partners to provide additional information to EMS.
- Sasha closed 3.1 and able to open report 5.1 and start inputting.
- Kate attended Sustainability Supply Chain Conference on 10<sup>th</sup> May in London, Ram unable to attend and she presented REAMIT. Body Shop (cosmetics) was interested in REAMIT and will be in touch shortly to help them achieve sustainability goals. Life cycle assessment was a common term used at this conference.

## WPC

- Final newsletter (first draft) first week in June to send off before everyone leaves project. The newsletter has had little input from partners, however, it has been discussed that this one will be bigger due to thank you to subscribers and saying goodbye. The subscription service has now been switched off however, they can view existing letters.
- Xavier would add update on Burns Farm Meats to newsletter.
- James would add information from Nates trip to newsletter relating to Raman spectroscopy and fresh detect.
- Xavier proposed mentioning hourly paid students in newsletter to showcase their participation. Possibly an image or screenshot from a meeting to show their involvement (no faces required).
- Kate will supply Sasha with a short paragraph relating to her sustainability presentation at Sustainability and Supply Chain Conference.
- Tamiris sent Sasha information relating to a conference and possibly Yan.
- Omar sent Sasha link to Science day which will also be included.
- Sasha has updated pages on website with partner information. Website will be live until 2027.

**Next meeting: 06 June, 9am.**

## REAMIT sub-group meeting notes, 06/06/2023

### WPT1

University of Nantes – Omar Dib

- UoN participated in the colloquium on AI and modelisation in Nantes 05/06/2023.
- UoN presented their research on food quality and its implementation in the industry using Raman sensors.
- The presentation received positive feedback and generated interest in topics such as machine learning for scaling up Raman spectroscopy. Attendees also discussed the importance of making Raman systems IoT compliant. Overall, the symposium facilitated



meaningful discussions on advancing food quality assessment and its integration with spectroscopy advancements.

- James will be visiting UoN for installing the raspberry Pi on 08/06/2023

Ulster University – James

- James discussed updating the WPT1 deliverables and including pilot test information and the Importance of informing Gael about ongoing progress since they haven't met in months
- Planning to work on a publication over the summer
- Will be working on Freshdetect and will do a trial
- Need to speak with Mark Logan to obtain data on dry aged meat: Request for dry aged data from three different runs
- Confirmation of the availability of a sample for testing for the spectrometer at UoN

UCD – Xavier

- Discussed the functionality of binary sensors for door status in the chambers
- Consideration of implementing alert system based on temperature thresholds and door status and receive feedback before the end of the month
- Will be writing an article for the newsletter

BED - Kate

- Lack of updates and responses regarding HMF sensors and collaborations with Julian
- Exploration of Knowledge Transfer Partnership (KTP) opportunities with Human Foundation, but no feedback received
- Lack of communication and response from Yumchop regarding future collaborations and moving sensors to the van
- Mention of potential funding streams and collaborations with no news or response from Yumchop
- Paola's attendance at a Cost info Day and discussion of eligibility requirements for cost actions and research funding
  - Need for inclusion of elite researchers and participation from at least seven countries in the proposals.
  - Participants from eastern part of Europe
  - Next call on October

- Cost Action program, associated with Horizon Europe, discussed as a potential funding opportunity for research projects and keep REAMIT alive.
- Idea of establishing a cost action for a global network of human milk banks to share knowledge and digitalize the banks.
- Lack of response and communication from Natalie regarding a follow-up meeting.

Sasha

- Mention of equipment return from Glen Affrick and plans to ship it to Marcel in Netherlands and need to resend it via DHL for tracking purposes.
- Suggestion to consider a private courier for easier and reliable shipping, with invoice payment for the service.

## **WPT2**

- Mention of deliverable 4.1 regarding the creation and launch of the interface: Confirmation that James has been working on it and received positive feedback from Ram. Need some screenshots to demonstrate the features of the dashboard.
- James plans to finish the deliverable, include references and screenshots, and send it to Whyser and the team.
- James mentions that he cannot include certain details in the deliverable about the creation and launch of the interface due to the private nature of Whyser 's dashboard.
- deliverables 4.2 (user manual on launching the interface= completed)
- 5.1 (big data platform for sensor data collection).
  - Joy has been working on 5.1, 5.2 and 5.3 and will be completed in the coming days and will share it soon
  - Joy's contract ended in May, so there are concerns about her hours and how to handle the situation.
- Ram has delegated responsibilities for the deliverables among Tamina, Yan, and himself.
- Mention of deliverables 5.3 (web interface), 5.4 (user manuals) are Davinder's responsibility and they are all completed
- James is working on 8.2 but needs input from John Charles and others to fill in missing information to complete the deliverable.
- The document prepared by Gautam has been rewritten, and additional scripts and data are needed to improve the ML models and results.
- James mentions that he has obtained results for the HMF and has rewritten the introduction. He has also updated the web app and achieved a 98% accuracy model.
- He expresses concern about John Charles' workload, as he was assigned to work on several deliverables, including Picnic, Biographs, and Raman. Gautam and Sahar were initially assigned to work on HMF and Yumchop.
- James discusses the need to document work that may have been done but not yet documented, such as the statistical process control analysis for Yumchop.
- James will put the 8.2 deliverable in the sharepoint.

- Kate will have a look in the 8.1 deliverable
- Ram is positive about the deliverables and suggests using videos to demonstrate the integrated technologies instead of producing paper documents for all of them.

### **WPT3**

- Xavier states that hourly paid positions have been offered to master's students at UCD to assist with deliverables in T3. Two students have already been engaged, and tasks will be assigned to them soon.
  - The students will be involved in tasks related to literature reviews and analysis, including analyzing survey data.
- James: The completion of the LCA deliverable is mentioned, with a small update required based on more accurate food waste calculations.
- James: Work on deliverables 1.1, 1.2, and 2.1 is well underway, and the market readiness report is being worked on, including a review of sensor technologies and pulling out relevant information from Gael's work package one document.
- James: Lee is working on the literature review for the market readiness report, while other parts of the report are mostly completed.
- Xavier: discuss the nature and scope of the business prospectus deliverable (4.1) and whether it should be a small promotional document or a larger document.
- The team agrees to reach out to Ram for clarification and guidance on the deliverable 4.1.
- Deliverable 4.2, which focuses on a business case for achieving 40,000 tons of waste reduction, is discussed. Tamiris is expected to help with the calculations and data analysis for this deliverable.
- James is suggested to schedule a meeting with Ram and Yan to gain clarity on the deliverables and seek his input.
- Kate mentioned that Mylam, the Remits officer at the funding organization, wants to review the completed deliverables individually rather than all at once.

### **WPM**

- Paula will finish the Yumchop's story telling and send it today.

Kate

- Work package management challenges are discussed, including issues with closing reports 4.1 and 4.2 due to fund transfers and discrepancies in costs.
- An onsite visit by Mylam took place, during which she asked questions about project progress, challenges, and deliverables. She expressed concerns about the number of

companies benefiting from the project, which is an important indicator for reporting to the European Commission.

- Emails were exchanged with Mylam regarding the evaluation of REAMIT. A separate SharePoint folder has been set up for Mylam to review completed deliverables.
- The final project report (5.1) is in progress, and all partners should arrange audits for it. The deadline for audits is approaching, and a reminder will be sent.
- There was an issue with an on-the-spot check by UCD, but it is being discussed with the secretariat for clarification.
- The minutes from a subgroup meeting are missing, and Sasha is requested to send them before going on holiday.
- Mylam, the evaluator, is relatively new and lacks a broad overview of different projects. However, she was satisfied with REAMITs' presentation and praised the project's communication and website.
- Deliverables from all partners will be collected and organized in the SharePoint folders, and a reminder email will be sent regarding closure deadlines and audits.
- It is emphasized that the partners should submit all deliverables by June 16th through EMS, as it is crucial for the completion of the final project report.
- The deadline for completing progress reports in EMS by 16 of June has been emphasized, as it marks the project end date and end of eligibility for costs.
- Partners are urged to pay for their audits by June 16th as costs cannot be claimed afterward. The audit process starts on August 1st at the Bedfordshire level, and everything should be submitted to the JS by August 31st.

### **WPC**

- Sasha is working on the final newsletter, which will serve as a farewell message. The first draft will be ready soon, and it will include updates on various topics, such as the scientific day, conferences, Raman trials, and Burn farm meats. Additional updates on events and achievements are also welcome.
- Kate will provide a short communication on HMF to the newsletter and a poster showcasing REAMIT's achievements for the Business School Showcase on June 16th is being prepared
- Usha offers to provide an article on the visit to human recommendation, along with screenshots, and news from the Business School Showcase event.
- Usha expects to send the content for the poster on the same day, and the team will collaborate to make it visually appealing.
- The achievements section of the poster will focus on the impact of the project, including improved processes, financial indicators, and changes in environmental, social, and economic aspects.
- Usha will provide information on the number of companies worked with, supported, and the resulting impact.
- Sasha will reach out to the contact at Bedfordshire regarding the press release, and Usha will collaborate with Yan to make the poster visually appealing.

- Testimonials from Yumchop and HMF have been received, and Usha requests the forwarded emails to include them in impact case studies for Yumchop and the poster.
- James will assist in gathering testimonials for Ulster's pilots
- The infographic and timeline are mentioned, and James is asked to review the data he provided for the timeline. It is unclear if certain data, such as sensor technology usage, is relevant to the timeline.
- James shares a link to a timeline and target group values chart, which Usha reviews. James discusses about the presentation of the target groups reached and the need to update the numbering to reflect the target values.
- The presentation of the target groups reached in the graph is discussed, with the need to combine the target values and reached values for clarity.
- James offers to help visualize the number of solutions implemented by pilot companies and suggests additional impact-related statistics to include, such as technological impact, economic impact, and environmental impact.
- Kate agrees to review the timeline and target groups reached to ensure accuracy and considers adding statistics on the number of companies introduced to the REAMIT approach and implementing REAMIT technologies.
- Kate suggests updating the communication strategy document with recent events, and the importance of including upcoming events is emphasized.

**The availability of the team members on June 21st is confirmed**

## WP T1 meetings

### WP T1 meeting, 19/10/2020

#### **Participants:**

Chair: Gael Maugis (I&R), Ram Ramanathan (BED), Lohithaksha Maiyar (BED),  
Katarzyna Pelc (BED), Imke Hermens (Whysor), Ali Assaf (UoN), William Duffy (UU)

#### **General comments:**

- It's mandatory to have at project level a dedicated storage where to upload all the presentations  
Once available slides will be uploaded.  
@Beds to let us know when it's done
- Need to know when the server collecting all the data generated by the pilots for the analytics will be accessible. For the moment for IT security reason this is not possible for a person outside from the university to access this server
- @Lohit : let us know when this issue is solved
- I'll not reflect what we have in the slides.
- It's now important **WP.T2** is in touch with pilot for data analytics because the pilots will start to generate data and it's important to anticipate the work to be done on decision making tool.

#### **Pilot France (Ali):**

- Need to get an approximate date when the Pilot with STEF could start
- Routhiau use their own truck to transport the food, in that case why their logistic department is not involved instead of STEF ? This is just to understand
- Need to make a second campaign of test in Lab for DB purpose (November)
- The pilot needs to go beyond lab, otherwise it will not be qualified as REAMIT pilot test

It is a requirement that all REAMIT pilot tests will have, as a common minimum requirement, traditional sensors (temperature/humidity/etc.) and GPS are fitted and linked to the cloud so that we can monitor a measure of food quality remotely and continuously (Minute RM 19.12.03 of RSC meeting Sep19). Hence, it is important that tests are conducted with traditional sensors as well, in addition to Raman sensors.

Further, RR also enquired about the separate French pilot, in addition to the one conducted at UoN.

#### **Pilots Netherlands & Germany (Imke):**

- **Netherlands:** Sensor installed and does not work like it should
- **Germany:** Sensor/GW installed in customer building. Values of VOC are sometimes over max values. To be corrected by the supplier, next step is to install the sensor in the truck.

**3D Fluorescence Pilot (William):**

3D Fluorescence not yet foreseen to be deployed. Is there any plan to make it?

**Pilot from UCD (Fionnuala & Shane):**

Could you provide information on the expected Pilot even if it still delayed due to Covid-19 restrictions? Do you have something to share with us?

Please ensure that the Irish pilot has the common minimum requirement as above. We are concerned with the continued non-participation by UCD in REAMIT meetings. We request that UCD attend the next meeting on 16 November.

Next meeting of WP T1 pilot test leads: 16 November 2020.

## WP T1 meeting, 16/11/2020

### Presents:

Name	Institution
Ali Assaf (AA)	UoN
Imke Hermens (IH)	Whysor
Lohithaksha Maniraj Maiyar (LM)	BED
Katarzyna Pelc (KP)	BED
Fionnuala Murphy (FM)	UCD
William Duffy (WD)	UU
Gael Maugis (GM)	I&R

All the presentation with update from pilots are available under the sharepoint:

**REAMIT Documents > WP T1 Meeting > Slides Meeting 16 Nov 2020**

### GENERAL INFORMATION:

BED server accessibility:

#### **Action:**

Lohit to inform the pilots when the server is able to collect their data. For the moment it's not possible to provide access to person external to the university

Data template

#### **Action:**

Fionnuala to share the template among partners within 3 weeks.

### PILOT FRANCE (Ali):

- Ali to set up the configuration as proposed by Cristian (I&R) to be able to collect data from IQRF sensor
- Data from the Raman are collected under the cloud, traditional sensor data will come soon
- Second round of tests on the meat sample from Routhiau to start on 23<sup>rd</sup> Nov-2020

#### **Action:**

Ali, Cristian: Once it works all partners involved in the data analytic will be informed and can start their work

### PILOT NETHERLANDS & GERMANY (Imke):

#### Netherlands:

- 1 sensor was installed, another one will be sent. Work on shock detection for calibration purpose on going



If a box goes 50 cm down, the sensor should send alert. We will send it to Picnic to see if that 50 cm is OK, or do we need to change it. If a box falls down by 50cm, this implies the box was treated badly

**Action:**

Imke to provide an update on the calendar for the next steps with Picnic.

**Germany:**

- Difficult to get contact, they promised to install the sensor but no news.
- Values of VOC are sometimes over max. FW update to be done to solve the issue, no delay on the calendar

**ULSTER PILOT TESTS:**

William explained he'll have a meeting this week with an Italian company. They contacted William after the Symposium saying they were interested in the clostridium bacteria pilot test with WD Meats.

**Action:**

William to inform partners what is the next step

Update with WD Meat pilots

**Action:**

William to inform partners what is the next step

**NEW PILOT TESTS:**

**France:**

New pilot could start with Pescanova (Sea Food) but before it's mandatory to have test in LAB in order to build the DB for comparison afterward

**Action:**

Ali to provide an update as soon as progress is made with them

Egg Pilot test

**Action:**

Ali to provide an update

Kate attended a B2B meeting (following the Symposium) with Stephanie Guillotin from Biotech Santé Bretagne. Kate discussed with Stephanie possibilities for identifying an end user in France for REAMIT pilot tests, as well as possibilities for cooperation in the REAMIT Capitalisation proposal. Stephanie confirmed she has in mind fresh fruits and vegetables producer company that could be interested in piloting the REAMIT technology

**Action:**

Gael to follow after Kate's introduction to the French company

**Germany:**

Imke shared with Kate & Ram few contact

**Action:**

**Kate** to confirm if they can be considered as a new pilot.



## WP T1 Meeting, 15/02/2021 (Goto Meeting)

### Participants:

Name	Institution
Imke Hermens (IH)	Whysor
Lohithaksha Maniraj Maiyar (LM)	BED
Katarzyna Pelc (KP)	BED
William Duffy (WD)	UU
Miao Wang	UCD
Nevedha Saravanarajan	UCD
Gael Maugis (GM)	I&R

All the presentation with update from pilots are available under the SharePoint:  
**REAMIT Documents > WP T1 Meeting > Slides Meeting 15 Feb 2021**

### GENERAL INFORMATION:

#### BED server accessibility:

It's now possible to connect the SQL DB thanks to the help of Levstone.

Next step : transfer Whysor cloud to BED Cloud.

**Action:** Lohit to setup a meeting with Tom from Whysor

#### Data Analytics:

Guatam (ITTralee) needs to get information on type of data coming from pilot tests.

Two kind of information needed:

1. T°, humidity, CO2, pressure, quality of food...
2. When the data will be available, what is the threshold above which the food is still considered as good

**Action:** Guatam to prepare and share a template to be filled by pilot partners. As soon as it's available, share the link under the SharePoint

#### PILOT FRANCE (Ali, update provided by mail):

Ali not available. No update.

#### **Other:**

COVID Situation: Lock-down from 30 Oct -> 15 Dec 2020, now we're in a "normal" situation, home office is still the rule, curfew [6PM – 6 AM]

#### PILOT NETHERLANDS & GERMANY (Imke):

##### Netherlands:

- Difficult to get in contact with Picnic
- Measurement done with 2 sensors

- Some issue with sensors, t° reacts very slow, shock detection is not correctly reported

**Action:**

Arrange a meeting between Whysor and Picnic to improve measures

**Other:**

COVID Situation: Lock-down 14-Dec 2020 -> 3-Mar 2021; Schools closed; work from home

Curfew [21PM - 4:30 AM]

**Germany:**

Despite a lot of efforts spent on this pilot, Weyers informed Whysor they don't want to continue and, unfortunately, we must stop this pilot.

**ULSTER PILOT TESTS:**

Update with WD Meat pilots/ Dry aging:

- GW & Sensors configured
- Don't know when the pilot will really start, LD period doesn't ease

Update with WD Meat pilots/ Clostridium:

- Still difficult to get contact from WD Meats
- Follow-up meeting to plan

3D Fluorescence:

- Wait for Freshdetect transfer to UU

**Other:**

COVID Situation: Lock-down from 21-Oct -> 1-Dec and from 26-Dec -> 8-Mar

**NEW PILOT TESTS:**

**France:**

Pescanova & Egg Pilot test

**Action:**

Ali to provide an update

Discussion between Stephanie Guillotin (Biotech Santé Bretagne) and Gael on Feb 04<sup>th</sup>.

**Action:** Stephanie will come back to Gael after presenting Reamit to potential end-users

**Germany:**

Imke shared with Kate & Ram few contact

Food supply chain (poultry) interested with bacteria issue

**UK:**

New pilot with Yumchop

Whysor specified the equipment, BED will publish a tender to select the best option



## WP T1 Meeting, 15/03/2021 (Goto Meeting)

### Participants:

Name	Institution
Imke Hermens	Whysor
Katarzyna Pelc	BED
William Duffy	UU
Miao Wang	UCD
Nevedha Saravanarajan	UCD
Sasha Bennett	NTU
Gael Maugis	I&R

All the presentation with update from pilots are available under the Sharepoint:

**REAMIT Documents > WP T1 Meeting > Slides Meeting 15 March 2021**

### GENERAL INFORMATION:

Request from Kate:

#### **Action: @All pilot lead**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot leads send this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.

If a Pilot lead is not able to attend the meeting, this information should be send (to Kate and me) ahead of the meeting.

Role description for:

Nevedha: she will conduct with Ali (UoN) data analysis for French Pilot (Process to be finalized)

Miao (Master Student): she will conduct data analysis for Dutch Pilot

**Action: @Fionnuala** to send an email to Kate informing Nevedha and Miao's role in the project, because Imke who is the contact lead for the Dutch Pilot was not aware.

Due Date: as soon as possible

**Action: @Miao** to send an email to Imke for sharing her expectation

### **Data Analytics:**

Guatam (ITTralee) needs to get information on type of data coming from pilot tests.

Two kind of information needed:

3. T°, humidity, CO2, pressure, quality of food...
4. When the data will be available, what is the threshold above which the food is still considered as good

Gautam made a presentation of the template and needed information

**Action: @All pilot lead** to review and fill the template and send it back to Gautam

The template is available under the Sharepoint "WP T1 Meeting"

If something is not clear thanks to contact Gautam

### **PILOT FRANCE:**

Ali not available.

Update provided by mail:

- 1) Eggs analysis finalized (IGRECA). Report has been shared with Igreca in order to continue the discussion and follow-up
- 2) Discussion on going with Fionnuala for data analysis (collaboration)
- 3) New matrix analysis (fruits & vegetables): it'll start next week
- 4) Next step: discuss with Lohit on the way to send data

COVID Situation:

Since 18 March, curfew [7PM – 6 AM]

Lock-down for few regions (Paris, North, South-East)

### **PILOT NETHERLANDS & GERMANY (Imke):**

#### **Netherlands:**

Cool Box: Shock detection and t° are correct but with some "issue"

- Change of t° variation: It doesn't measure fast enough. Tom and Marcel look for to make it working faster
- Shock detection: we have the latest shock during the last 5 minutes but not the most important. Question has been raised to the manufacturer, they'll study the request. If possible and the manufacturer accepts to make a correction, firmware updated would be needed.

**Confidentiality agreement:** still on-going, but we should leave the initiative to Picnic

**Action:**

**@Imke**, Foresee new budget for sensor purchasing if the issue on t° cannot be solved (fast detection)

**Other:**

COVID Situation:

Lock-down 14-Dec 2020 -> extended to March 30<sup>th</sup>; Schools closed; work from home

Curfew [21PM - 4:30 AM]

**Germany:**

Weyers sent back to Whysor the HW.

No new partner.

**ULSTER PILOT TESTS:**

Update with WD Meat pilots/ Dry aging:

- Documentation produced
- Sensors to be setup to Reamit Dashbord (By William)
- Don't know when the pilot will really start

Update with WD Meat pilots/ Clostridium:

- Need to confirm the sensor will detect the bacteria
- Begin April: expect to get access to the campus
- No idea how the bacteria growth-up during the L-D period

Easter period will be very busy

**Other:**

COVID Situation: Lock-down from 21-Oct -> 1-Dec and from 26-Dec -> 1-April

**NEW PILOT TESTS:**

**France:**

Pescanova & Egg Pilot test

**Action:** Ali to provide an update

Discussion between Stephanie Guillotin (Biotech Santé Bretagne) and Gael on Feb 04<sup>th</sup>.

**Action:** Stephanie will come back to Gael after presenting Reamit to potential end-users

One partner might be interested, he'll contact me if he is.

**Germany:**

Imke shared with Kate & Ram few contact

Food supply chain (poultry) interested with bacteria issu.



Kate approached 2 persons in Germany through Contact Person for Germany. Links to national contact persons are available on the website of Interreg NEW Programme.

**UK:**

New pilot with Yumchop. Whysor specified the equipment, procurement process on-going. Sensor will be configured by Whysor. Whysor will travel to install the sensors but need to be sure to have the guarantee to be back.

## WP T1 Meeting, 19/04/2021 (Teams)

### Participants:

Name	Institution
Katarzyna Pelc	BED
Lohithaksha Maiyar	BED
William Duffy	UU
Nevedha Saravanarajan	UCD
Gautam Samriya	ITTRALEE
Sasha Bennett	NTU
Ali Assaf	UoN
Gael Maugis	I&R

All the presentation with update from pilots to be uploaded under the Sharepoint:

**REAMIT Documents > WP T1 Meeting > Slides Meeting 19 April 2021**

### GENERAL INFORMATION:

Request from Kate:

#### **Action: @All pilot lead**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test. Each pilot leads send this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.

If a Pilot lead is not able to attend the meeting, this information should be send (to Kate and me) ahead of the meeting.

#### **Data Analytics:**

Guatam (ITTralee) will contact each pilot leads in order to review the template and work with you to specify specific needs from the pilot.

#### **Action:**

**@Gautam** to plan one to one meeting with pilot leads

**@Pilot Leads** to contribute to the template, threshold to be provided by pilot leads & companies involved in pilot. Each pilot to get this information from companies

#### **PILOT FRANCE (Ali):**

- IGRECA (Eggs): French Egg company located in western France (Pays de La Loire & Brittany)

1<sup>st</sup> approach: 4 kind of samples received (Egg powder)

The aim is to evaluate the ability of the Raman spectroscopy to determine the chemical composition of the sample (for instance presence of salt)

1<sup>st</sup> report shared with Igreca, wait for new meeting with them in order to move forward on a potential pilot

Currently it is unclear what IGRECA will do with the obtained results from Raman measurements. UoN will meet with IGRECA to discuss it.

- Routhiau (chicken):

Wait for transmission activity to BED server (activity on-going)

Next step: transfer the data to Bed server

- Other pilot (Fruit):

Test on-going with Orange, Apple but no company so far involved in any pilot

⇒ Some concrete example to be shared to convince companies to join us to detect freshness of the fruits

Question from Lohit: SenX is waiting statistical model for data analysis

Question from Kate:

1. Move the pilot (Chicken) to the truck? Is it possible?
2. Meeting Friday 23 April with Levstone on data, link shared with Ali

Question from Gautam: Ali confirms Raman can detect chemical composition of egg samples, this is the same for the chicken but strongly linked with the storage condition

Question from Sasha: Include an update on Igreca in the next newsletter, Ali will provide inputs It can help to convince newcomers.

Question from Nevedha: Is there any standard established to compare? No for the moment

Question from Kate: presence of what kind of chemicals will be analysed in egg samples? Igreca has provided a list of chemical indicators to be used in the Raman tests.

### **COVID-19**

Lock-down from 3 April to 3 May

Curfew [19 pm - 6 am]

### **PILOT NETHERLANDS (Imke):**

Imke was not able to attend but shared prior to the meeting few information

### **Pilot Picnic**

- There has been no progress in the last month regarding getting the sensors to work correctly. We are dependent on an update in the software of the sensor to be done by the manufacturer. Until now, that update has not been done. We wanted to be up and running in March, but no luck so far. Things are going way to slow. Tomorrow I have a meeting with Marcel and Tom about how we can continue with this and speed things up.
- Regarding communication: Sasha and I have been in contact. She is making an overview of all communications in which the names of the pilot partners are mentioned. This overview I'm going to send to the marketing department of Picnic. Then they will decide whether they want to stay anonymous or not.
- Regarding NDA: I send all the input to Picnic but have not heard anything from them.

### **Possible new pilot BIOGROS**

- We met online with BIOGROS from Luxembourg. They are a wholesaler of organic food. They are interested in pilot testing REAMIT technologies. They are already familiar with sensor technique.
- Marcel and I are visiting their site on 4 May 2021.

### **Covid-19**

- The Netherlands are still in lockdown, until at least 28 April 2021.
- The Dutch government made a plan for re-opening the Netherlands. Step 1 is re-opening shops and terraces and abolish the curfew. Tomorrow we have another press conference and hear whether the first step can be made. This depends on the contamination figures, which are not yet good now.
- Curfew from 2200 h – 0430 h
- Higher education/universities are re-opening for 1 day per week on 26 April 2021.
- We are not allowed to travel until at least 15 May 2021. We are allowed to travel for work when necessary.

**Data requirements for REAMIT project (document Gautam)**

I have not yet worked on the document. This Friday we have an extra meeting for WPT2 on data requirements. I hope that things become clearer after that meeting. I am planning to work on this next week.

**ULSTER PILOT TESTS:**

Update with WD Meat pilots

Dry aging:

- Sensors configured and started to send data to dashboard; all is working but sensors are not installed in WD Meats but in William's home. WD Meats has not responded yet to William's emails regarding when they will open up and allow for installation of sensors. Actual installation of sensors at WD Meats factory in simple.
- We need objective measures of meat quality (to be obtained from WD Meats).
- No date has been confirmed yet by WD Meats regarding when REAMIT team can access WD Meats factory to install sensors.

Update with WD Meat pilots / Clostridium Bacteria:

- William still has not heard from UCD regarding the clostridium bacteria (whether UCD can send samples of CB to Ulster and whether the bacteria is in good condition for analysis); William is going to look for this bacterium from other suppliers;
- With a sample of CB, Ulster will be able to confirm the limit of detection of CB by the sensors.

Ulster has met with a Cash and carry group in NI, who are interested in participating in a REAMIT pilot test. They confirmed food waste inside lorries, shops, distribution centre, so they do have many avenues to explore. They are pretty open and seem interested to work with the REAMIT team. They say that meat products coming from suppliers already have been exposed to high temperatures. 3D fluorescence sensors could be used to determine meat spoilage.

**Other:**

COVID Situation: Lock-down from 21-Oct -> 1-Dec and from 26-Dec -> 1-April (to be updated)

**NEW PILOT TESTS:**

**France:**

Discussion between Stephanie Guillotin (Biotech Santé Bretagne) and Gael on Feb 04<sup>th</sup> 2021.

**Action:**

Stephanie will come back to Gael after presenting Reamit to potential end-users

One partner might be interested, he'll contact me if he is.

19 April 2021: Not yet contacted by this company, to remind Stephanie if she has any update.

**UK:**

**Yumchop**

Whysor specified the equipment for the pilot test with Yumchop. BED is responsible for the procurement of equipment for Yumchop. BED is collecting all paperwork necessary to obtain internal permissions for the purchase of equipment. All equipment will be shipped to Whysor. Sensor will be configured by Whysor and Whysor will travel to install the sensors at Yumchop's food factory (however, Whysor staff must be sure they will be able to return to the NL).

#### **Unilever**

BED team approached UK based food producing company – Unilever. Unilever are owners of many popular food brands (e.g. Knorr, Hellman's, Lipton, Carte d'or, Pot Noodle, etc.), and they are interested in developing a pilot test with REAMIT. First exploration meeting took place on 20/04/2021 attended by Ram, Kate, Yan and Unilever representative. Second meeting will take place at the end of May 2021.

#### **Glen Affric Brewery, UK**

NTU partners have recruited a new UK-based company for a pilot test in REAMIT. It is a brewery producing beer. A first exploration meeting took place on 20/04/2021. NTU have sent NDA to the new pilot test partner.

## **WP T1 Meeting, 17/05/2021 (Teams)**

#### **Participants:**

<b>Name</b>	<b>Institution</b>
Katarzyna Pelc	BED
Lohithaksha Maiyar	BED
Imke Hermens	Whysor
William Duffy	UU
James Gillespie	UU
Nevedha Saravanarajan	UCD
Fionnuala Murphy	UCD

Shane Ward	UCD
Xavier Cama	UCD
Tamiris Costa	UCD
Gautam Samriya	ITTRALEE
Sasha Bennett	NTU
Usha Ramanathan	NTU
Gael Maugis	I&R

#### General information:

On 1 July, Dr **James Gillespie** will join the REAMIT team at Ulster University. He will take over the role of William Duffy in the REAMIT project, as William will be leaving the REAMIT team next week (20th of May). **Thanks a lot William for your participation and your support in the pilot implementation from all the consortium.**

All the presentation with update from pilots to be uploaded under the Sharepoint:

**REAMIT Documents > WP T1 Meeting > Slides Meeting 17 May 2021**

#### GENERAL INFORMATION:

Request from Kate:

##### **Action: @All pilot lead**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot leads send this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.

If a Pilot lead is not able to attend the meeting, this information should be send (to Kate and me) ahead of the meeting.

#### PILOT NETHERLANDS (Imke):

### **Pilot Picnic**

- Whysor ad online meeting with Picnic on 3 May 2021.
- Whysor need firmware update of the software and since ELSYS plans to do this update in 1 or 2 months, Picnic and Whysor have agreed to start testing with the sensors as they are (measuring temperature only, and not measuring shock detection). In this way, the tests with Picnic can start now.
- Data from sensors can be sent every 5 minutes, however the settings can be changed so that data can be sent every 2 min; data can also come sooner than this.
- Sensors with Alternate enclosure tested by Tom
- Testing will start in 2 weeks time (beginning of June 2021)
- More sensors will be tested - 20 in total will be installed in cool boxes in Picnic e-vehicles.

### **Communication:**

Does Picnic allow us to publish something? Picnic needs an overview of the REAMIT communication plan for the pilot test with Picnic. Picnic needs to validate this plan before the company's name can appear in any REAMIT publication.

It'd be great to have 1 poster + 1 video per pilot.

Kate suggested asking Picnic what kind of publication they would like to get from REAMIT project. Picnic will not claim any costs.

Action for Imke: To discuss with Picnic the REAMIT communication plan for the pilot test with Picnic and hear Picnic's preferences.

Non-Disclosure agreement between Whysor and Picnic: Imke has sent the template to Picnic but they have not come back to Whysor about it.

**Kate: to invite all pilot to attend the WP T1 presentation during the next RAC+WP+RSC meeting (July 06<sup>th</sup> afternoon)**

### **Possible new pilot BIOGROS**

- BIOGROS from Luxembourg. They are a wholesaler of organic food.
- start measuring simple things in order to define if it could be a possible pilot, wait for Biogros feedback

### **Data Analytics:**

- Imke : no update from Picnic

### **COVID-19**

- Government is relaxing COVID 19 measures
- Until 18 May work at home remains the rule
- More relaxations will be introduced from 19 May



**IRISH PILOT TESTS (Xavier):**

Xavier Cama will work on the Irish pilot test from UCD, Cyberbar technology should be used.

Tamiris Costa will work on the LCA

**ULSTER PILOT TESTS (William):**

WD Meats – Dry ageing trial

- There have been no updates to this trial due to problems contacting WD Meats. We have attempted to contact WD Meats to confirm a start date several times but have not heard anything back.
- The 5 sensors and gateway are all configured and ready for installation. They have been ready for installation for several months.
- The lockdown within NI has been relaxing recently so there should not be any coronavirus blocking point

WD Meats – Clostridium Estertheticum trial

- The placement student has been fully trained in the swabbing and DNA extraction.
- We are holding off on procurement of the swabs until we have confirmation from WD Meats that they are continuing with the trial as they are quite expensive.
- We have not heard any updates from the contacts with James Dooley has in UCD. This is likely due to on-going restrictions within the Republic of Ireland.

3DF trial

- No updates on progress

Musgrave trial

- Musgrave are a food wholesaler in Northern Ireland. After recent talks they have expressed interest in running a trial regarding vehicles which deliver food to retailers.
- Temperature and humidity sensors will be installed within the vehicles, with these vehicles containing chilled food.
- One sensor has been purchased, known as a Thermobeacon.
- The final goal of the trial would be an alerting system which would alert if temperature or humidity levels change to a level which could cause spoilage.
- The trial is expected to start next month.
- The next steps are to develop an Android application which can be installed on the company phones to read from the sensors and upload the data to the cloud.

**Other:**

Lockdown continues to relax

**UK PILOT TESTS (Kate):**

**Yumchop**

It's a family founded factory, for frozen meals (African kind of food).

The food is sold in containers at different places.

Whysor has specified the equipment for the pilot test with Yumchop (T° tracking). The T° will be monitored in the factory, during the transport to the NHS (place where the pilot will be) in order to make sure the t° is in the threshold.

BED purchased equipment for this pilot test. All equipment is being shipped to Whysor's address for configuration.

Next step: install the sensors inside Yumchop's food factory.

#### **PILOT FRANCE (Ali):**

- IGRECA (Eggs): French Egg company located in western France (Pays de La Loire & Brittany)

1<sup>st</sup> approach: 4 kind of samples received (Egg powder)

The aim is to evaluate the ability of the Raman spectroscopy to determine the chemical composition of the sample (for instance presence of salt)

1<sup>st</sup> report shared with Igreca, wait for new meeting with them in order to move forward on a potential pilot.

Valorial will arrange a meeting in order to discuss the result of the report

- Routhiau (chicken):

Wait for transmission activity to BED server (activity on-going)

Next step: transfer the data to Bed server

- Other pilot (Fruit):

Test on-going with Orange, Apple but no company so far involved in any pilot

- ⇒ Some concrete example to be shared to convince companies to join us to detect freshness of the fruits

#### **Covid-19**

End of the Lock-down on 19 May.

Curfew [21 pm - 6 am]

#### **COMMUNICATION:**

Sasha discussed with all partner their communication actions, in order to update our CS strategy document for reporting purposes.

#### **NEW PILOT TESTS:**

##### **France:**

- Discussion between Stephanie Guillotin (Biotech Santé Bretagne) and Gael on 4 Feb 2021.

No feedback despite several reminder

- Kate requests I&R and Valorial to have a new French pilot.

Action I&R and Valorial to be engaged in order to recruit a new one.

##### **UK:**

### **Unilever**

BED team approached UK based food producing company – Unilever. Unilever are owners of many popular food brands (e.g. Knorr, Hellman's, Lipton, Carte d'or, Pot Noodle, etc.), and they are interested in developing a pilot test with REAMIT. First exploration meeting took place on 20/04/2021 attended by Ram, Kate, Yan and Unilever representative. Second meeting will take place at the end of May 2021.

### **Glen Affric Brewery, UK**

NTU partners have recruited a new UK-based company for a pilot test in REAMIT. It is a brewery producing beer. A first exploration meeting took place on 20 April 2021. NTU have sent a NDA to the new pilot test partner.

## WP T1 Meeting, 21/06/2021

### Participants:

Name	Institution
Katarzyna Pelc	BED
Imke Hermens	Whysor
James Gillespie	UU
Xavier Cama	UCD
Tamiris Costa	UCD
Gautam Samriya	ITTRALEE
Sasha Bennett	NTU
Gael Maugis	I&R

### General information:

I'd like to welcome, Dr **James Gillespie** (UU) who will take over from William.

**All the presentation with update from pilots to be uploaded under the Sharepoint:**  
**REAMIT Documents > WP T1 Meeting > Slides Meeting 21 June 2021**

### GENERAL INFORMATION:

Request from Kate:

#### **Action: @All pilot lead**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot leads send this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.

If a Pilot lead is not able to attend the meeting, this information should be send (to Kate and me) ahead of the meeting.

### PILOT NETHERLANDS (Imke):

#### Pilot Picnic

- Last week contact established by phone with Picnic as it was difficult to reach them.
- Test with 20 new sensors within 2-3 weeks

Next step on communication: in order to not “stress” them it’s better to not ask all at the same time. This step will come later on after starting the test.

Communication a reminder and expectations from Picnic:

Does Picnic allow us to publish something? Picnic needs an overview of the REAMIT communication plan for the pilot test with Picnic. Picnic needs to validate this plan before the company’s name can appear in any REAMIT publication.

It’d be great to have 1 poster + 1 video per pilot.

Kate suggested asking Picnic what kind of publication they would like to get from REAMIT project. Picnic will not claim any costs.

Action for Imke: To discuss with Picnic the REAMIT communication plan for the pilot test with Picnic and hear Picnic’s preferences.

Non-Disclosure agreement between Whysor and Picnic: Imke has sent the template to Picnic but they have not come back to Whysor about it.

**@Imke : TO INVITE PICNIC TO ATTEND THE NEXT RSC MEETING**

#### Data Analytics:

- Imke : no update form Picnic

#### Possible new pilot: BIOGROS

- BIOGROS from Luxembourg. They are a wholesaler of organic food.
- start measuring simple things in order to define if it could be a possible pilot, wait for Biogros feedback
- Keen on getting back to Whysor, still interested to participate
- Define the sensors to be used

#### Possible new pilot: Van de Huijgevoort Groep

Van de Huijgevoort Groep:

- Van de Huijgevoort Vers = VDH Fresh, production company bread salads and toast salads, potato salads, meat processing company for cold cuts and semi-finished products (e.g. chicken for in salads, minced meat for sausage roll)
- Plus van de Huijgevoort (= 3 supermarkets)

They don't have a lot of waste, listeria issue could be monitored. (Use of Fresh Detect?)

### **COVID-19**

- The Dutch government is relaxing the COVID measures.
- From 26th of June everything is reopening again with 1.5 m distance:
- Stores, bars, restaurants, musea, etc. have normal opening hours again
- Work at the office for max. half of the time
- Events are allowed from June 30th
- From 15 May, there is a travel advice per country
- Mouth cap is obliged in public transports, stations, airports and in secondary education

### **IRISH PILOT TESTS (Xavier):**

Xavier Cama is working on a pilot around transportation & location (CyberBar + QR Code)

#### Plan:

Preliminary plan to be worked before starting to work with Shane.

Discussion with one company but not responding

#### Next step:

Build the box themselves inspired from Fresh Detect with sensors measuring T° & Humidity

Meeting with Munster University

#### @Xavier :

- To prepare some slides about the idea for the RSC Meeting, what is the strategy to approach a new company?
- To arrange a meeting with Imke/Tom for sensors discussion

### **Data Analytics:**

Meeting made last week with Shane & Xavie & Gautam

### **ULSTER PILOT TESTS (William):**

WD Meats – Dry ageing trial

The LoRaWAN temperature and humidity sensors and gateway for the dry-aging trial have been procured and configured and are currently sending data to the REAMIT dashboard. The sensors are due to be installed in the dry-aging chamber at WD meats on 6 July 2021.

#### WD Meats – Clostridium Estertheticum trial

The clostridium trial has been faced with multiple delays, largely due to the difficulty in procuring a sample of the bacteria which is required to confirm the total viable count. James Dooley has been promised a sample from UCD however we still await this. There were long delays in communication with UCD as the contact was a PhD student who was preparing to sit their viva. In the meantime, clostridium has reappeared on the production line at WD meats and Marc (WD employee) is now freezing swabs for Ulster to process. The DNA extraction kit required for the next steps of this trial has now been placed into the university ordering system

#### 3DF trial

- No updates on progress

#### Musgrave trial :

- Musgrave are a food wholesaler in Northern Ireland. After recent talks they have expressed interest in running a trial regarding vehicles which deliver food to retailers.
- Temperature and humidity sensors will be installed within the vehicles, with these vehicles containing chilled food.
- One sensor has been purchased, known as a Thermobeacon.
- The final goal of the trial would be an alerting system which would alert if temperature or humidity levels change to a level which could cause spoilage.
- The next steps are to develop an Android application which can be installed on the company phones to read from the sensors and upload the data to the cloud.
- Musgrave has given the go-ahead for a pilot test involving the monitoring of the temperature on their last-mile delivery vans. Since Northern Ireland does not have a LoRaWAN network, bluetooth sensors will have to be used for this pilot and the phones recording the data will need an application developed to automatically upload the data to the REAMIT cloud. Work on developing this bespoke app is currently in the exploration phase

#### COVID-19

Lockdown continues to relax

#### UK PILOT TESTS (Kate):

##### **Yumchop:**

It's a family founded factory, for frozen meals (African kind of food).

The food is sold in containers at different places.

Whysor has specified the equipment for the pilot test with Yumchop (T° tracking). The T° will be monitored in the factory, during the transport to the NHS (place where the pilot will be) in order to make sure the t° is in the threshold.

Sensors procured and are now in Whysor premises for configuration.

Next step: install the sensors into the containers

Installation of sensors at Yumchop's factory has been planned for summer 2021.

Whysor has planned a visit to UK in the first half of August 2021 (combination of vacation and work) and visit Yumchop's factory. However, due to new requirements of a 2-week quarantine period (when entering UK and when returning to the NL), this visit may not be possible. Imke confirmed Whysor partners were flexible, and would reassess the situation at the end of July 2021 and will then take a decision whether they will travel to the UK in the first half of August.

#### **Human Milk Foundation:**

Charity working to help more families feed their babies with human milk

The aim of the pilot is to monitor the T° of the milk from a donor (30-50 per day) and the hospital

Pilot test to start in July after identifying the right sensor. The sensor assessment is still on-going by Whysor and only after 50 sensors should be purchased. Pilot will start first with 2 sensors.

#### **COVID-19**

Step 3 restrictions is on hold in UK and 4 weeks delayed.

Step 4 foreseen mid of July 2021

#### **NEW PILOT:**

**Unilever: they will not participate**

#### **Glen Affric Brewery, UK:**

NTU partners have recruited a new UK-based company for a pilot test in REAMIT. It is a brewery producing beer. A first exploration meeting took place on 20/04/2021. NTU have sent a NDA to the new pilot test partner. This pilot has been postponed to end of July.

#### **PILOT FRANCE (Ali):**

##### **Pilot on chicken with Routhiau:**

Main action:

- Meetings with whysor & Bed on the transmission of data (script to send data to Bedford server). Discussion with Senx on the data analysis.
- Discussion with Routhiau, we have a meeting on 9 July 2021 to discuss about the possibility to use their truck for our test.
- No reply from Stef : many request from Gerald

##### **Eggs from IGRECA:**

Data were sent to Igreca, and we had a meeting with him (with I&R and Valorial). IGRECA need more time before to decide if they are interested in our technology and how to integrate it !



NEW PILOT

Fruits and vegetables:

New company “prince de Bretagne” is very interesting. We aim to start a new test with him in July or later (discussion is under progress) + many action of communications with I&R and Valorial, and also Nottingham.

COVID-19: No restriction

## WP T1 meeting, 19/07/2021

### Participants:

Name	Institution
Katarzyna Pelc	BED
James Gillespie	UU
Xavier Cama	UCD
Tamiris Costa	UCD
Gautam Samriya	ITTRALEE
Sasha Bennett	NTU
Gael Maugis	I&R

General information:

All the presentation with update from pilots to be uploaded under the Sharepoint:  
**REAMIT Documents > WP T1 Meeting > Slides Meeting 19 July 2021**

### **GENERAL INFORMATION:**

Request from Kate:

#### **Action: @All pilot lead**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot leads send this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing

clarifications.

If a Pilot lead is not able to attend the meeting, this information should be send (to Kate and me) ahead of the meeting.

**PILOT NETHERLANDS (Imke not present but Slides shared prior to the meeting):**

**Pilot Picnic**

Whysor have visited Picnic fulfilment centre in Apeldoorn on Tuesday 13/7/21 and installed 4 sensors.

4 sensors installed in 2 different boxes in order to define:

- What is the best position for the sensor: on the bottom or at the top
- What is the best way to stick the sensors (hard plastic) to the box (styrofoam). We tried two different types of glue: manufacturer's double-sided tape and special flexible adhesive sealant

Sensors are working fine; data is coming in Whysor platform

**Next Step:**

1. Defining best position for sensor inside the box
2. Defining what glue to use to install the sensors inside the box
3. Installing 20 boxes with one sensor
4. Gathering data
5. Data to partners to analyze
6. Next step: Cooling profile per coolbox
7. Data requirements
8. Communication → mail has been sent to Frank

**Possible new pilot: BIOGROS** No Update

**Possible new pilot: Van de Huijgevoort Groep**

Van de Huijgevoort Groep:

- Van de Huijgevoort Vers = VDH Fresh, production company bread salads and toast salads, potato salads, meat processing company for cold cuts and semi-finished products (e.g. chicken for in salads, minced meat for sausage roll)
- Plus van de Huijgevoort (= 3 supermarkets)

They don't have a lot of waste, listeria issue could be monitored. (Use of Fresh Detect ?)

**June 2021:**

June 1st : First meeting with Ard van de Huijgevoort

June 22nd: Second meeting with Luc van de Huijgevoort, Ard van de Huijgevoort

Update July 2021:

Online meeting with NTU/ BED/ Whysor and Van de Huijgevoort groep to get acquainted and talk about their use case.

Still exploring the type of sensors (T°)

Pilot test for 1<sup>st</sup> challenge: ensuring different pressure in different chambers, as this keeps insects (flies, mosquitoes, etc.) away. Pressure sensors to be used for this pilot test.

Pilot test for 2<sup>nd</sup> challenge: 3 types of bacteria are contributing to food waste: listeria, ecoli and salmonella. BED and Whysor discussed learning from the experienced with WD Meats – where the challenge is also to isolate one specific type of bacteria (clostridium) in meat factory. Perhaps 3D Fluorescence sensors would be used for this pilot test or sensors developed by Senspidx.

Next Step:

- Whysor visits producing facility of Van de Huijgevoort Groep after August 22 (due to summer holidays)
- Defining architecture and use case
- Whysor advises NTU on what sensors to buy

IRISH PILOT TESTS (Xavier):

Xavier Cama is working on a pilot around transportation & location (CyberBar + QR Code)

Plan:

1. Request quote for data logger (25 €), T° & Humidity
2. Paperwork for using vehicle
3. Box.

Question from Kate: Shane is in contact with a chicken company – Carston Group => No response

Focus is made on a prototype, no contact with other companies.

James proposes to introduce to a chicken company.

@Xavier to prepare few lines presenting the concept.

**ULSTER PILOT TESTS (James):**

No update, just back from holidays.

Dashboard: James to contact Davider (Levstone) to check synchronisation to BED server (because UCS is using their own App' and Levstone is developing one) and check their application limitation

WD Meats – Dry ageing trial

Update from June meeting : The LoRaWAN temperature and humidity sensors and gateway for the dry-aging trial have been procured and configured and are currently sending data to the REAMIT dashboard. The sensors are due to be installed in the dry-aging chamber at WD meats on 6th July 2021.

WD Meats – Clostridium Estertheticum trial

No update

3DF trial

- No updates on progress

Musgrave trial :

- Musgrave are a food wholesaler in Northern Ireland. After recent talks they have expressed interest in running a trial regarding vehicles which deliver food to retailers.
- Temperature and humidity sensors will be installed within the vehicles, with these vehicles containing chilled food.
- One sensor has been purchased, known as a Thermobeacon.
- The final goal of the trial would be an alerting system which would alert if temperature or humidity levels change to a level which could cause spoilage.
- The next steps are to develop an Android application which can be installed on the company phones to read from the sensors and upload the data to the cloud.
- Musgrave has given the go-ahead for a pilot test involving the monitoring of the temperature on their last-mile delivery vans. Since Northern Ireland does not have a LoRaWAN network, bluetooth sensors will have to be used for this pilot and the phones recording the data will need an application developed to automatically upload the data to the REAMIT cloud. Work on developing this bespoke app is currently in the exploration phase

@James: Send an email to Maastrich (they were in the capitalization proposal). Would they be interested to work with UCD as an external consultant? James to send an email asking how we could collaborate and explain the plan. What would be the best option to work together and collaborate?

**COVID-19**

Lockdown continues to relax

#### UK PILOT TESTS (Kate):

##### **Yumchop:**

It's a family founded factory, for frozen meals (African kind of food).

The food is sold in containers i.e. vending machines at different places in the UK such as e.g. hospitals, universities.

Whysor has specified the equipment for the pilot test with Yumchop (T° tracking). The T° will be monitored in the factory, during the transport to the NHS (place where the pilot will be) in order to make sure the t° is in the threshold.

Sensors procured and are now in Whysor premises for configuration.

Next step: install the sensors into the containers

Whysor tried to ship equipment to Yumchop, but the cost of extra tax paid at delivery would be EUR 500. BED started to look for an alternative solution:

- BED asked Yumchop if they had any facility to pick up equipment directly at Whysor's office. Yumchop said No.
- BED looked for another currier. BED approached a private courier company, that offered to pick up equipment at Whysor on 22/07/2021 and deliver it to Yumchop on 22/07/2021. The cost of transportation will be GBP 35, to be paid by Yumhop at delivery.

BED and Whysor are currently finalizing transportation of equipment from NL to UK.

##### **Human Milk Foundation:**

Charity working to help more families feed their babies with human milk

The aim of the pilot is to monitor the T° of the milk from a donor (30-50 per day) and the hospital

Pilot test to start in July after identifying the right sensor. The sensor assessment is still on-going by Whysor and only after 50 sensors should be purchased. Pilot will start first with 2 sensors lent to HMF by Whysor.

Whysor tried to ship equipment to Yumchop, but the cost of extra tax paid at delivery would be EUR 500. BED started to look for an alternative solution:

- BED asked HMF if they had any facility to pick up equipment directly at Whysor's office. HMF said No.

- BED looked for another carrier. BED approached a private courier company, that offered to pick up equipment at Whysor on 22/07/2021 and deliver it to HMF on 22/07/2021. The cost of transportation will be GBP 35, to be paid by HMF at delivery.

BED and Whysor are currently finalizing transportation of equipment from NL to UK.

#### NEW PILOT:

##### **Glen Affric Brewery, UK:**

NTU partners have recruited a new UK-based company for a pilot test in REAMIT. It is a brewery producing beer. A first exploration meeting took place on 20/04/2021. NTU have sent a NDA to the new pilot test partner. This pilot has been postponed to End of July.

NDA to be signed and go ahead.

Idea: fix a threshold to the sensor (T°) and raise an alert.

**German Pilot:** new contact after the RSC Meeting

**Gautam:** No update, people are on holidays and back in 3 weeks

#### PILOT FRANCE (Ali):

No update received from UoN. Wait for slides to be uploaded in the Sharepoint

## WP T1 meeting, 23/08/2021

### Participants:

Name	Institution
Imke Hermens	Whysor
Katarzyna Pelc	BED
James Gillespie	UU
Gautam Samriya	ITTRALEE
Sasha Bennett	NTU
Gael Maugis	I&R

General information:

All the presentation with update from pilots to be uploaded under the Sharepoint:  
**REAMIT Documents > WP T1 Meeting > Slides Meeting 23 August 2021**

### GENERAL INFORMATION:

Request from Kate:

#### **Action: @All pilot lead**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test. Each pilot leads send this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications. If a Pilot lead is not able to attend the meeting, this information should be send (to Kate and me) ahead of the meeting.

### PILOT NETHERLANDS:

#### **Pilot Picnic**

4 sensors installed inside the crates:

- 2 not working properly and 1 lost
- Best position for installation is top of the box with double side tape
- Data are collected

#### Next Step:

1. Gathering data
2. Data to partners to analyze
3. Next step: Cooling profile per coolbox



4. Data requirements
5. Communication à mail has been sent to Frank, no reaction yet

@Gautam: to connect with Imke, How to approach Picnic for food quality/communication

Keep in mind is shock detection is still useful

**Possible new pilot: BIOGROS** Meeting planned begin of September

**Possible new pilot: Van de Huijgevoort Groep**

Van de Huijgevoort Groep:

- Van de Huijgevoort Vers = VDH Fresh, production company bread salads and toast salads, potato salads, meat processing company for cold cuts and semi-finished products (e.g. chicken for in salads, minced meat for sausage roll)
- Plus van de Huijgevoort (= 3 supermarkets)

Visit on 31 August, Whysor will talk more with them about the Use Case.

**IRISH PILOT TESTS (Xavier):**

@Xavier: thanks to add few lines to update your pilot and upload slides in the sharepoint

**ULSTER PILOT TESTS (James):**

**WD Meats – Dry ageing trial:**

Trial ended on 21 July after 14 days, data generated for analysis.

Installation of a repeater is under study to install a 5<sup>th</sup> sensor.

Question from Kate:

What does labeling data mean? Machine learning model.

How many cycles? 1, Wait for another data from Mark

Question from Gautam: Can the data be shared with all partners? Yes

**WD Meats – Clostridium Estertheticum trial:**

Skeptical to use Fresh Detect

DNA extract tool is broken, delay in the trial, new machine to order? Wait for James's feedback.

**3DF trial :**

One FreshDetect system delivered to Xavier @ UCD. Having a think about joint collaboration project

Potential use in the checking of poultry products being delivered to Musgrave Cash and Carry.

Communication with Matthias about this

**Musgrave trial :**

- Musgrave are a food wholesaler in Northern Ireland. After recent talks they have expressed interest in running a trial regarding vehicles which deliver food to retailers.
- Temperature and humidity sensors will be installed within the vehicles, with these vehicles containing chilled food.
- The final goal of the trial would be an alerting system which would alert if temperature or humidity levels change to a level which could cause spoilage.
- The next steps are to develop an Android application which can be installed on the company phones to read from the sensors and upload the data to the cloud. This App will be developed by UCD which is requirement for sensors use by Musgrave
- Musgrave has signed the contract and sensor purchased (to check if temp/humidity sensor like the ones being used for HMF / yumchop are the most suitable)

#### **UK PILOT TESTS (Kate):**

##### **Yumchop:**

It's a family founded factory, for frozen meals (African kind of food).

The food is sold in containers i.e. vending machines at different places in the UK such as e.g. hospitals, universities.

All the sensors have been delivered.

Installation of the GW: online meeting support to help for the configuration but no heard from them.

BED is in touch but no progress.

##### **Human Milk Foundation:**

Charity working to help more families feed their babies with human milk

The aim of the pilot is to monitor the T° of the milk from a donor (30-50 per day) and the hospital

All the sensors have been delivered.

2 sensors are being installed (Installation in the bag and need to define the trip they will do)

1 sensor not properly connected

#### **NEW PILOT:**

##### **Glen Affric Brewery, UK: No Update**

Idea: fix a threshold to the sensor (T°) and raise an alert.

##### **UK:**

- **New BlueSkys** : Fresh food, need to guarantee the T°
- **Wines company**: Pallets are stolen during the transport. Is it possible to use REAMIT technology for tracking ?

**German Pilot:** Meeting planned Begin of September (Flowers producer)

#### **PILOT FRANCE (Ali):**

**@Ali:** thanks to add few lines to update your pilot and upload slides in the sharepoint



## WP T1 meeting, 20/09/2021

### 11 Participants:

Name	Institution
Imke Hermens	Whysor
Katarzyna Pelc	BED
Sahar Ahmadzadeh	BED
James Gillespie	UU
Gautam Samriya	MTU
Sasha Bennett	NTU
Xavier Cama	UCD
Tamiris da Costa	UCD
Ali Assaf	UoN
Gael Maugis	I&R
Gladys Gallot	I&R

General information:

All the presentations with update from pilots to be uploaded under the Sharepoint:  
**REAMIT Documents > WP T1 Meeting > Slides Meeting 20 September 2021**

### GENERAL INFORMATION:

Request from Kate:

#### **Action: @All pilot leads**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot lead sends this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.

If a Pilot lead is not able to attend the meeting, this information should be send (to Kate and me) ahead of the meeting.

2 new people are joining the REAMIT project this month:

- Dr Sahar Ahmadzadeh at the University of Bedfordshire, as the new Research fellow. She replaces Lohit who left the project in June 2021.
- Gladys Gallot at Images & Réseaux. She will work jointly with Gaël and progressively take over from him the lead on WP T1.

**PILOT NETHERLANDS:**

**BIOGROS pilot (Luxembourg):**

Supplier of high-quality organic food

- **Objective:** to gain insight on the climatic conditions (temperature and humidity) through the complete supply chain (trucks, warehouse, grower) for several fragile vegetables (mushrooms, onions, potatoes, celery root).
- **Progress:** contact + work on the definition of use case
  - on 14<sup>th</sup> September, meeting between BIOGROS – Whysor – BED
  - information meeting with food experts from the consortium about ripening of food and vegetables
- **Next step:**
  - define which sensors to use and deploy ->meeting with Whysor and technicians from BIOGROS will be planned shortly
  - Imke to provide to Kate information on what and how many sensors should be purchased
  - BED to initiate the procurement process of sensors for BIOGROS
- **Expected starting date:** October 2021

**Action:** Imke to provide Kate with information on what sensors need to be purchased for this pilot test.

**Action:** Kate to initiate the procurement process of sensors for BIOGROS.

**Van de Huijgevoort Groep pilot (The NL):**

Bread, salads and meat processing company for cold cuts and semi-finished products (chicken for salads, minced meat for sausage roll)

- **Objectives:** 1- to shorten the checks process on bacteria (listeria, salmonella) and avoid quality product loss (due to freezing and thawing) 2-to check the production room pressure
- **Progress:** Whysor visited Van de Huijgevoort Groep's facilities on 31 August 2021 and started talks about the use case.
- **Next steps:** define the architecture of the pilot test and which sensors to use and deploy (freshdetect sensor + sensors to detect pressure?!)
- **Expected starting date:** still to be determined

**Action:** James to check with Joan about the lending of freshdetect sensor and transportation issues from Ulster to Whysor.

**Picnic pilot:**

- **Starting date:** November 2020
- **Progress:** On 9 September 2021 - follow-up meeting with Picnic: sensor housing is not sustainable enough and broke when heavy groceries were put on top or bumped to the housing. All the 20 sensors installed have broken down, except 1 -> solution found by Whysor: building a prototype of 2 flexible rings printed by a 3D-printer to protect the sensor housing.

- **Next steps:** new sensors have to be purchased  
 +Still waiting for an answer from Picnic about the communication
- **COVID-19 related issues:** restrictions are loosening up again in Netherlands

**Action: Kate to purchase 20 sensors for Picnic.**

->Whysor team is due to travel across the UK next week to visit several pilot tests.

#### IRISH PILOT TESTS (Xavier):

- **Progress:** preliminary testing experiments carried out over 5 days (20-24<sup>th</sup> August 2021).
- **Next steps:** 1- line up the pilot: analyse device pre-calibration data and build a PLS model + establish how to use the system on a pilot (request assistance to precalibrate the instrument for other sample types). 2-recruit sustainable Irish agribusiness user for pilot testing
- **Expected starting date for a pilot test:** October 2021 (delay due to holidays and purchase orders approval at UCD).

**Action: Xavier to get in touch with James to discuss the implementation of this pilot test.**

**Action: Xavier to write down ideas and plan for this pilot test.**

#### ULSTER PILOT TESTS (James):

##### **WD Meats – Dry ageing trial:**

- **Starting date:** 6th July 2021
  - **Objective:** To reduce weight and quality lost from beef meat during the dry-aging process by installing temperature and humidity sensors to map readings across chambers.
  - **Progress:** lessons learned from 1<sup>st</sup> pilot for the 2<sup>nd</sup> pilot
    - ✓ change velcro to cable ties
    - ✓ load less meat into the chamber + reposition the sensors to being mounting on the rails (not on the walls)
    - ✓ restructure the sensors location: 2 at the front and 2 at the back
- the sensors supplier has discontinued the production of sensors
- **Next steps:** -schedule the 2<sup>nd</sup> trial (will be the last one) – objective: to see the effect of the dry ageing process over the entire 21 days cycle (vs 1<sup>st</sup> trial – 14days). +contact with Marc for structuring of sensors.

##### **WD Meats – Clostridium Estertheticum trial:**

- **Objectives:** To strengthen the method of detection allowing for immediate clean up of surfaces when detected and reduced beef waste in abattoirs, retailers and homes.
- **Progress:** James Dooley confirmed that the qPCR machine was able to be repaired
- **Next steps:** delivery of this kit + meeting with James soon to discuss next steps once the kit arrives. Source the bacteria sample from UCD (no clear solution currently found).

- **Expected starting date for a pilot test:** not known.

#### **3DF trial:**

- **Objective:** Use 3DF technology to reduce food waste. 3DF sensors can be used to make determinations of total bacterial count on products or liquids.
- **Progress:**
  - Interviews conducting with sensing companies to find an appropriate device
  - Matthias confirmed that some testing had been trialed through cellophane, however the cellophane would need to be pressed right against the poultry fillet in order to achieve an accurate reading.
- **Next steps:** freshdetect sensor need to be used on a flat surface of poultry for it to produce accurate reading- should be technically possible. Need to purchase an android mobile.
- **Expected starting date for the pilot test:** not known.

#### **Musgrave trial:**

- **Objective:** to install temperature and humidity sensors and have an alerting system /cloud upload from Musgrave phone which can warn if food at risk of spoilage.
- **Progress:** since initial talks held with Musgrave, they fully signed off on the pilot. Test sensor purchased.
- **Next steps:** Cellular IoT temp/humidity sensors could be used for this trial, but need to be purchased first. To configure cellular sensors with online support from Whysor. Marcel due to reply this week to suggest suitable sensors for purchase.  
 +check the connectivity in Northern Ireland. To purchase Android mobile phone to connect to sensors and upload to cloud.
- **Expected starting date for the pilot test:** end of October 2021.

#### **UK PILOT TESTS (Kate):**

##### **Blue Skies pilot:**

Company in Bedfordshire producing fresh food, cut where produced and then sent to the UK.

- **Objective:** to monitor temperature in containers in which fresh food is stored during transit by plane from overseas locations in Brazil, South Africa, etc. to UK.
- **Progress:**
  - On 14th July 2021-meeting online between BED and Blue Skies
  - Confirmation by REAMIT officer at Joint Secretariat that REAMIT could go ahead with the implementation of this pilot test (even if outside North West Europe region)
  - Whysor gave input about this pilot test -> connectivity issues and lack of experience with cargo travelling overseas are the key challenges with this pilot test

**Action:** Whysor to advise which sensors should be used for this pilot test.

**Action:** Whysor to advise whether this pilot test is doable for the REAMIT team.

##### **Yumchop pilot:**

UK based company selling frozen food ready to eat (warm food in microwave)

- **Starting date:** 21 December 2020
- **Objectives:** 1-To ensure that frozen food is stored in the right temperature in the Yumchop food factory. 2-To ensure that frozen food is transported in the right temperature from Yumchop food factory to where vending machines are located (e.g. NHS hospitals) or to private homes (Yumchop home delivery service). 3-To provide food fingerprint (i.e. data on the condition in which food produced by Yumchop has been stored and transported).

**Progress:**

-On 3rd September 2021, Ram Ramanathan and Sasha Bennett visited Yumchop for 'Yumchop Factory Launch' event, Towcester, UK.

-On 14th September 2021, Abi Adefisan (from Yumchop) reported a delay with installation of gateway. She confirmed, Yumchop would do it on 22nd September 2021.

- **Next steps:** Whysor is planning a visit to Yumchop on 27-30 September 2021 to help with installation of the equipment inside the food factory.

**Human Milk Foundation pilot:**

Human Milk Foundation (HMF), founded in 2017 in UK, is a charity working to help more families feed their babies with human milk.

- **Starting date:** July 2021
- **Objective:** to monitor temperature in which human milk is transported between a donor – Human Milk Bank – Hospital/home; and send alerts if these conditions change.
- **Progress:**
  - Since 7<sup>th</sup> August 2021, 2 sensors have been installed in the bags and went on 8 trips.
  - After 19<sup>th</sup> August 2021, connectivity issue has popped up and no data from the sensors have been recorder since then. \*Both sensors use NBIOT (band system in the UK, special kind of mobile connection for low power devises). It is likely that NBIOT is weak in some parts of UK, while it is stronger in other parts of UK.
  - On 26<sup>th</sup> August 2021, an online meeting between HMF, Whysor and BED took place, to address connectivity and updating configuration of one of the sensor.
  - >Both sensors were sent on a trip again, but one of them still did not connect to network and hence, it did not update its configuration.
- **Next steps:** Whysor is planning a trip to UK on 27-30 September 2021 to meet with HMF, reconfigure both sensors and make sure they start recording and sending data.

**Glen Affric Brewery pilot (Sasha):**

- **Objective:** to monitor temperature in 18 beer tanks at the brewery.
- **Progress:** the company is happy to go ahead.
- **Next steps:** On 28 September 2021, Whysor will visit Glen Affric to assess on the spot the needs for sensor equipment.

**Action:** Whysor to confirm which sensors should be used for this pilot test.

**Action:** Sasha to procure sensors indicated by Whysor.

**PILOT FRANCE (Ali):**



**Routhiau pilot:**

- **Progress:** -tests done on chicken samples->data available and shared with partners  
-on July: meeting with the managing director of Routhiau to discuss the results and prepare the next steps
- **Next steps:** test in real conditions the sensors by putting them in refrigerator trucks – still waiting for Routhiau approval.

**Prince de Bretagne pilot:**

Eventually they declined the pilot test. The contact person at Prince de Bretagne said the company had no time to try any new technology. Ali is looking for another local company willing to be involved in the REAMIT pilot test.

**Action:** All pilot leads to send to Sasha few lines about the new pilots for the October newsletter.

## WP T1 meeting, 18/10/2021

### 11 Participants:

Name	Institution
Imke Hermens	Whysor
Katarzyna Pelc	BED
Sahar Ahmadzadeh	BED
James Gillespie	UU
Gautam Samriya	ITTRALEE / MTU
Sasha Bennett	NTU
Xavier Cama	UCD
Tamiris da Costa	UCD
Adrienne Gentil	Valorial
Gael Maugis	I&R
Gladys Gallot	I&R

**Absent:** Ali Assaf, UoN

General information:

All the presentations with update from pilots to be uploaded under the Sharepoint:  
**REAMIT Documents > WP T1 Meeting > Slides Meeting 18 October 2021**

### GENERAL INFORMATION:

Request from Kate:

#### **Action: @All pilot leads**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot lead sends this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.

If a Pilot lead is not able to attend the meeting, this information should be send (to Kate and me) ahead of the meeting.

**Meeting recording:** [https://imagesetreseaux-my.sharepoint.com/:v:/g/personal/ggallot\\_images-et-reseaux\\_com/EcYmJlyD6oJHgDUu1pAw700Bw1Xr71wloUCTI8c5sf8Muw](https://imagesetreseaux-my.sharepoint.com/:v:/g/personal/ggallot_images-et-reseaux_com/EcYmJlyD6oJHgDUu1pAw700Bw1Xr71wloUCTI8c5sf8Muw)

## UK PILOT TESTS (Kate):

### **Yumchop pilot:**

UK based company selling frozen food ready to eat (warm food in microwave)

- **Starting date:** 21 December 2020
- **Objectives:** **1-**To ensure that frozen food is stored in the right temperature in the Yumchop food factory. **2-**To ensure that frozen food is transported in the right temperature from Yumchop food factory to where vending machines are located (e.g. NHS hospitals) or to private homes (Yumchop home delivery service). **3-**To provide food fingerprint (i.e. data on the condition in which food produced by Yumchop has been stored and transported).
- **Progress:**-On 28<sup>th</sup> September 2021, partners from Whysor visited Yumchop (Abi Adefisan, Michael Adefisan and Francis Odudimu) to install 10 sensors and gateway.  
 -Thresholds for the sensors have been established in the fridges and the freezers at Yumchop (alerts sent when 2 measurements of the temperature goes beyond +5°C and below -18°C) with gauges (red-orange-green) defined.
- **Next steps:** Whysor will organise an online meeting with Abi, Michael, Francis to give them some more explanation about the use of the dashboard. They still need log-in data.

### **Human Milk Foundation pilot:**

Human Milk Foundation (HMF), founded in 2017 in UK, is a charity working to help more families feed their babies with human milk.

- **Starting date:** July 2021
- **Objective:** to monitor temperature in which human milk is transported between a donor – Human Milk Bank – Hospital/home; and send alerts if these conditions change.
- **Progress:**
  - On 27<sup>th</sup> September 2021, Imke and Marco from Whysor visited HMF to correct the set up for connectivity to internet for both sensors. Marco was able to fix the connectivity issue, while Imke made a dashboard for HMF in reamit.whysor.com. Marco and Imke explained to Mike (HMF) how he could work with the dashboard, and he seemed to be working with it just fine. Mike gave Imke and Marco a short tour at HMF. Mike confirmed he was going to try to send the sensors with human milk transport.
  - Early in October 2021, Whysor partners reported that both sensors at HMF were working well and sent lots of data to the REAMIT cloud at Whysor. However, the data indicates room temperature only. This implies that both sensors are not sent on trips with human milk. Kate contacted HMF twice in October to ask about it as well as about scaling up of this pilot test (installation of 50 sensors), but has not received any answer from HMF.

### **Blue Skies pilot:**

Company in Bedfordshire, UK producing fresh food, cut where produced and then sent to the UK.

- **Objective:** to monitor temperature in containers in which fresh food is stored during transit by plane from overseas locations in Brazil, South Africa, etc. to UK.

- **Progress:** Whysor gave input about this pilot test -> Imke confirm that it is interesting to pursue this pilot test –however, we should be honest about what we can promise (since we have little experience with connectivity worldwide).

***Opportunity for a new pilot test:***

On 5<sup>th</sup> October 2021, Kate attended an online meeting for UK agrifood companies. She initiated contact with an ice-cream producer interested in the REAMIT project. A meeting will be scheduled shortly. Also, Kate initiated dialogue with Ernst & Yung in the UK, with team supporting access to finance for agri food companies in UK.

**Action:** Kate to approach Blue Skies again to discuss when we can start the pilot test.

**Action:** Kate to approach Ice Cream company in UK to discuss their involvement in the REAMIT pilot test.

**Action:** Kate to arrange an online meeting with E&Y contact for UK agri food companies.

**Glen Affric Brewery pilot (Sasha):**

A family owned Brewery, based in Liverpool, UK, producing canning and distributing beer around the country.

- **Starting date:** September 2021
- **Objective:** To minimise wastage during brewing and maintain the highest quality in beer produce, considering factors such as oxygen levels, gravity levels, temperature and yeast content. Ideally, GA would like to have a system to monitor and regulate the beer – where the sugar content, CO2 content, temperature control etc is all optimized. First issue to be solved: knowing when a beer is ready to be canned. To have better knowledge of what is happening on in the fermentation towers.+ the wasted barley is currently given away as food for animals but can be used more effectively.
- **Progress:**-Online meetings with Whysor, Dan Bradley, NTU and the team at Glen Affric have been had throughout the year of 2021. A non-disclosure agreement has been signed between NTU at Glen Affric.  
 -Sasha along with Whysor visited the site of Glen Affric in September 2021 for a full tour of the Brewery and understanding their needs and requirements for our sensor technology.  
 -A LORA-WAN Gateway device has been installed successfully at Glen Affric by Marco from Whysor. 1 temperature sensor has been installed in their cool store, however according to the threshold it is too cold inside.
- **Next steps:** procurement and purchase of sensors, installation of sensors, begin data monitoring.

**Action:** Sasha to arrange a meeting with the University of Liverpool.

**Action:** Kate and Sasha to send documentations/presentations on breweries engaged in REAMIT pilot test to Adrienne (Valorial).

**PILOT NETHERLANDS:**

**Picnic pilot:**

- **Starting date:** November 2020

- **Progress:** - 20 new sensors have been purchased by BED. They have been delivered to Whysor on 22<sup>nd</sup> October 2021.  
 -Authorisation given by Picnic to use their name for communication purposes in REAMIT project.
- **Next steps:** -Meeting scheduled next week with Frank Vollerling, data scientist at Picnic for data requirements.  
 -On 14<sup>th</sup> October, meeting scheduled on communication issues with Sasha and Frank Gorte (Picnic).  
 -Picnic is going to share for specific days/ periods/ cases how many icepacks are being used, but not their complete heatplan.
- **COVID-19 related issues,** restrictions are loosening up in Netherlands since 25<sup>th</sup> September: end of the 1,5 metres distance from others, all events allowed, entry pass system introduced and apply to bars, restaurants, events, cultural venues, face masks are only mandatory in airports and (public) passenger transport). In November the government will again reassess the measures.

**Action: Imke to provide Sasha with updates about this pilot test for the October newsletter.**

#### **BIOGROS pilot (Luxembourg):**

Supplier of high-quality organic food

- **Objective:** to gain insight on the climatic conditions (temperature and humidity) through the complete supply chain (trucks, warehouse, grower) for several fragile vegetables (mushrooms, onions, potatoes, celery root).
- **Progress:** the work on the architecture has started, the 2<sup>nd</sup> part is not yet defined.
- **Next step:** On 8<sup>th</sup> November 2021 meeting planned with Whysor and technician at BIOGROS to define what temperature sensors are needed, the connectivity of sensors and a use case.
- **Expected starting date:** October 2021

#### **Van de Huijgevoort Groep pilot (The NL):**

Bread, salads and meat processing company for cold cuts and semi-finished products (chicken for salads, minced meat for sausage roll)

- **Objectives:** 1- to shorten the checks process on the presence of bacteria (listeria, salmonella) and avoid quality product loss (due to freezing and thawing) 2-to check the production room pressure
- **Progress:** no progress to report.
- **Next steps:** define the architecture of the pilot test and which sensors shall be used and deployed (fresh detect sensor + sensors to detect pressure?!)
- **Expected starting date:** still to be determined

**Action: James to check with Mathias about the lending of Fresh Detect sensors?**

#### **IRISH PILOT TESTS (Xavier):**

- **Progress:** preliminary testing experiments carried out over 5 days (20-24<sup>th</sup> August 2021).  
 -Carrier box has been purchased for the proof of concept tests, delivery expected on 20th October 2021.  
 -Sarah Davoren has been contacted to request assistance on recruiting new companies in Ireland for new pilot tests.

-Pending to contact Tahmina Ajmal (BED) on finding use cases for the Fresh Detect System to collaborate together

- **Next steps:** 1- line up the pilot: analyse device pre-calibration data and build a PLS model + establish how to use the system on a pilot (request assistance to precalibrate the instrument for other sample types). 2-recruit sustainable Irish agribusiness user for pilot testing
- **Expected starting date for a pilot test:** October 2021 (delay due to holidays and purchase orders approval at UCD).

**Action:** Xavier to add Gautam in the e-mail loop with Sarah.

**Action:** Xavier to talk with Tahmina (BED) about her research and possible future collaboration.

### ULSTER PILOT TESTS (James):

#### **WD Meats – Dry ageing trial:**

- **Starting date:** 6th July 2021
- **Objective:** To reduce weight and quality lost from beef meat during the dry-aging process by installing temperature and humidity sensors to map readings across chambers.
- **Progress:** lessons learned from 1<sup>st</sup> pilot for the 2<sup>nd</sup> pilot
  - ✓ change velcro to cable ties
  - ✓ load less meat into the chamber + reposition the sensors to being mounting on the rails (not on the walls)
  - ✓ restructure the sensors location : 2 at the front and 2 at the back

-the sensor supplier (concept13) has discontinued the production of sensors

- **Next steps:** -schedule the 2<sup>nd</sup> trial (will be the last one in 2021) – objective: to see the effect of the dry ageing process over the entire 21 days cycle (vs 1<sup>st</sup> trial – 14days) – unlikely another trial before Christmas  
 -Marc to suggest different structuring of carcass's / sensors after findings from trial before running experiment again to see effects?
- **Issues:** -Marc talked about 'Dark facings', which is unusable meat, occurring when the temperature / humidity is kept too low over the dry ageing process. But if we increase the temperature too much, slime forms on the meat from bacteria and we run the risk of spoiling the entire hindquarter. ->Ideally Marc would like to discover the ideal parameters for the dry ageing process which minimise dark facings while avoids harmful bacteria formulation. There is a statistically significant difference between the front and rear HQ weights due to the refrigeration unit located at the front of the lorry  
 - fluid dynamics?

#### **WD Meats – Clostridium Estertheticum trial:**

- **Objectives:** To strengthen the method of detection allowing for immediate clean up of surfaces when detected and reduced beef waste in abattoirs, retailers and homes.
- **Progress:** qPCR machine broke down over the summer which delaying ordering of the master mix clostridium kit.
- **Next steps:** -delivery of the Mastermix kit ordered from Cole-parmer, due to receive it on 25<sup>th</sup> October and aim to have it delivered to UU before end of October.

-to source clostridium bacteria - with UCD?

-to schedule a meeting with Sensipdx: (once the minimum level of detection calculated) : check if their equipment is suitable and if so; are they still willing to collaborate / how can we incentivize them? - they were originally approached for the capitalisation call (before Christmas?)

- **Expected starting date for a pilot test:** not known.

**Action: James to schedule a meeting with Sensipdx.**

### **3DF trial:**

- **Objective:** Use 3DF technology to reduce food waste. 3DF sensors can be used to make determinations of total bacterial count on products or liquids.
- **Progress:** One Fresh Detect sensor has been lent to UCD, another one was sent to Tahmina at Beds and Imke also wants to lend one Fresh Detect sensor for a Luxembourg pilot.
- **Next steps:** -Potential joint collaboration project with Xavier (UCD)  
 -Potential use in the checking of poultry products being delivered to Musgrave Cash and Carry. (communication with Matthias)-testing had been trialed through cellophane, however the cellophane would need to be pressed right against the poultry fillet in order to achieve an accurate reading +the freshdetect needs to be used on a flat surface of the poultry for it to produce accurate readings
- **Expected starting date for the pilot test:** not known.

**Action: Xavier to ship Fresh Detect sensor to Imke.**

### **Musgrave trial:**

- **Objective:** to install temperature and humidity sensors and have an alerting system /cloud upload from Musgrave phone which can warn if food is at risk of spoilage.
- **Progress:** -Decided it would be easier to use a cellular IoT temp/humidity sensor like the ones being used for HMF / Yumchop  
 -Meeting with Marcel to discuss the possibility of using cellular sensors for this trial ->Marcel has suggested he configures one sensor with temp/humidity probe and send to James this plus the programming module so he can repeat the configuration on additional 4 sensors.
- **Issues:** Marcel has suggested to monitor temperature / humidity 24/7, but to do that :  
 -need to know when the van is in motion / or when the doors are opened and closed (cold storage sensing) and create our own alerting algorithm so that we don't get alerts when the van isn't being driven + potential need to develop a mobile phone application but this would likely need driver intervention (to avoid)  
 + to use any cellular sensors comparable to the ones being used on the Picnic trial?
- **Expected starting date for the pilot test:** end of October 2021.

### **PILOT FRANCE (Ali):**

#### **Routhiau pilot:**

- **Progress:** work ongoing on the automation of Raman measurement for the integration of system in a food truck

- **Next steps:**

+Analysis of fruits from market

**Action: Ali to provide more information about the follow-up of the pilot tests.**

**IGRECA pilot:**

- **Progress:** done on IGRECA samples, data available & shared with partners, exploration of data, report sent to IGRECA and Valorial, communication document
- **Next steps:** confirmation of IGRECA + choice of pilot sample
- **Expected starting date:** ?

**New pilot test in France:**

**Action: Adrienne to approach agri food companies in Valorial's network and check possibilities for developing a new pilot test in France.**

**Action: All pilot leads to send to Sasha few lines about the new pilots by the end of this week (before the release).**



## WP T1 meeting, 15/11/2021

### 11 Participants:

Name	Institution
Imke Hermens	Whysor
Katarzyna Pelc	BED
Sahar Ahmadzadeh	BED
James Gillespie	UU
Gautam Samriya	ITTRALEE / MTU
Sasha Bennett	NTU
Usha Ramanathan	NTU
Xavier Cama	UCD
Tamiris da Costa	UCD
Gael Maugis	I&R
Gladys Gallot	I&R

**Absent:** Ali Assaf, UoN

General information:

**All the presentations with update from pilots to be uploaded under the Sharepoint:  
 REAMIT Documents > WP T1 Meeting > Slides Meeting 15 November 2021**

### GENERAL INFORMATION:

Request from Kate:

#### **Action: @All pilot leads**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot lead sends this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering

all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.  
 If a Pilot lead is not able to attend this compulsory meeting, this information should be send (to Kate and me) ahead of the meeting.

Meeting recording: [https://imagesetreseaux-my.sharepoint.com/:v:/g/personal/ggallot\\_images-et-reseaux\\_com/EXJQRKARz\\_5Mj18Stsy986ABMbHXC1QLJv4ch941UlsLQg](https://imagesetreseaux-my.sharepoint.com/:v:/g/personal/ggallot_images-et-reseaux_com/EXJQRKARz_5Mj18Stsy986ABMbHXC1QLJv4ch941UlsLQg)

### PILOT NETHERLANDS:

#### **Picnic pilot:**

- **Starting date:** November 2020
- **Progress:** - 20 sensors have been delivered to Whysor and the flexible protection for housing has been 3D-printed and delivered  
 -Meeting has been organised last month about the communication part
- **Next steps:** - to assemble the protection printed send them to Picnic and install inside the cooling boxes (for the next weeks).  
 -To plan a meeting with Frank Vollering, data scientist Picnic, for data requirements (hard to contact him at this point –probably in the coming weeks).
- **COVID-19 related issues:** Since 13th November 2021 a short, mild lockdown in the Netherlands has been put in place (social distancing, face masks, work at home, max. 4 guests per day at your home, restricted opening hours for many locations, restrictions for events, Corona entry pass for more locations).

#### **BIOGROS pilot (Luxembourg):**

Supplier of high-quality organic food

- **Starting date:** November 2021.
- **Objective:** to gain insight on the climatic conditions (temperature and humidity) through the complete supply chain (trucks, warehouse, grower) for several fragile vegetables (mushrooms, onions, potatoes, celery root).
- **Progress:** -on 8<sup>th</sup> November 2021: meeting with Whysor, Christelle and Roland (technician) from BIOGROS.  
 -BIOGROS is testing connectivity and specific usability of these units inside the warehouse, the trucks (trucks are not owned by BIOGROS but leased) and at 3 growers (e.g. environmental parameters)-  
 Research connectivity has been also conducted in Luxembourg.  
 -Whysor sent 2 sensor units (logger, RV/T sensor, sim-card, programming cable).
- **Next step:** -BIOGROS is looking into what data is already being measured and whether/ how these data can be made available for REAMIT.  
 -to decide what type of sensors to use for what environment and then to define use case and ordering sensors.

#### **Van de Huijgevoort Groep pilot (The NL):**

Bread, salads and meat processing company for cold cuts and semi-finished products (chicken for salads, minced meat for sausage roll)

- **Objectives:** 1- to shorten the checks process on the presence of bacteria (listeria, salmonella) and avoid quality product loss (due to freezing and thawing) 2-to check the production room pressure
- **Progress:** -Fresh detect sensor has arrived at Whysor
- **Next steps:** -to get expertise from UU or UCD to put in place and make working the sensor  
 -meeting with quality manager from VDHG is being planned to define the use case for measurements of overpressure.
- **Expected starting date:** still to be determined

**Action: Imke to set up a meeting with Xavier and Mathias for the use of the sensors**

**Opportunity for a new pilot test:**

-German, vegetables and food selling company situated near the Dutch border. Imke is trying to plan a meeting to visit them and possibly start a pilot test with them.

**UK PILOT TESTS (Kate):**

**Yumchop pilot:**

UK based company selling frozen food ready to eat (warm food in microwave)

- **Starting date:** 21 December 2020
- **Objectives:** 1-To ensure that frozen food is stored in the right temperature in the Yumchop food factory. 2-To ensure that frozen food is transported in the right temperature from Yumchop food factory to where vending machines are located (e.g. NHS hospitals) or to private homes (Yumchop home delivery service). 3-To provide food fingerprint (i.e. data on the condition in which food produced by Yumchop has been stored and transported).
- **Progress:** 10 sensors installed at Yumchop are working well and sending data recorded at REAMIT cloud at Whysor.
- **Next steps:** On 18 November 2021, an online meeting on 'REAMIT Dashboard for Yumchop' will take place, organised by Whysor and attended by Abi Adefisan and Michael Adefisan from Yumchop, Whysor and BED.  
 -Updates are needed from the company to know if data are sending correctly

**Action: Imke to send a doodle to REAMIT partners for the meeting on the presentation of the dashboard created by Whysor.**

**Action: Imke to show Kate how to extract data from the dashboard created by Whysor.**

**Human Milk Foundation pilot:**

Human Milk Foundation (HMF), founded in 2017 in UK, is a charity working to help more families feed their babies with human milk.

- **Starting date:** July 2021
- **Objective:** to monitor temperature in which human milk is transported between a donor – Human Milk Bank – Hospital/home; and send alerts if these conditions change.

- **Progress:** -on 30 October 2021 Kate met with Natalie Shenker (NS) from HMF and NS expressed concerns about working with REAMIT. According to them sensors delivered to HMF did not work and partners at Whysor did not respond to emails from HMF. -> Partners at Whysor questioned the skills and competencies of HMF technician (Mike), which caused break-up of communication with REAMIT in October 2021.  
 -On 12 November 2021, Whysor shared with BED sensor data from HMF in table format and 2 graphs.  
 -On 12 November 2021, Kate asked analytics partners (BED, MTU, SenX, Levstone) how to carry out data analytics of temperature data from 2 sensors at HMF  
 ->Tahmina Ajmal provided first observations about data from HMF: 2 sensors at HMF showed that 2 sensors worked well and recorded data in REAMIT cloud at Whysor in October 2021. 2 sensors were sent on 4 trips each in October 2021.  
 ->Gautam and James suggested that context for each journey is needed: length, schedule, what sensors are used, etc.  
 -On 12 November 2021 Kate sent an email to Natalie at HMF with graphical presentation of data from 2 sensors and suggested next steps: Scaling up the pilot test with HMF (installing more sensors)+ Helping resolve bottlenecks in communicating with REAMIT partners.  
 ->Natalie responded positively.
- **Next steps:** -Data analytics partners (BED, MTU, SenX, Levstone) to specify what else is needed to carry out data analysis of data from HMF.  
 -Data analytics partners to carry out data analysis based on data from 2 sensors at HMF – calendar TBC.  
 -BED to purchase new sensors for HMF.  
 -BED received confirmation from NS at HMF regarding scaling up the pilot test with HMF. NS suggested installing 10 new sensors at HMF.
- **Point of attention:** Request to include Kate in future email communication with HMF. +Request to be very careful when communicating with HMF (and other pilot test partners) not to upset them and consequently, not to lose them.
- Imke was not aware of this issue with HMF. The initial problem with sensors delivered to HMF was connectivity, i.e. lack of right internet connection. Imke will be happy to help, even if right now there is no communication between HMF and Whysor as the sensors are working well and sending data recorded at REAMIT cloud at Whysor.
- **Covid related issues:** UK is quite open but cases of infections are rising – infection rate : 354,6  
 46 009 463 people vaccinated (2 doses).

**Action:** Imke to let Kate know which sensors are needed for HMF (specification of sensors, the supplier of sensors for HMF and names of two other suppliers of sensors as Kate needs to present quotes from 3 suppliers at BED to comply with public procurement requirements).

#### **Blue Skies pilot:**

Company in Bedfordshire, UK producing fresh food, cut where produced and then sent to the UK.

- **Objective:** to monitor temperature in containers in which fresh food is stored during transit by plane from overseas locations in Brazil, South Africa, etc. to UK.
- **Progress:** nothing to report on 15 November 2021, as the company has not responded to Kate's 2 emails.

**Opportunity for a new pilot test:**

On 5<sup>th</sup> October 2021, Kate attended an online meeting for UK agrifood companies. She initiated contact with an ice-cream producer interested in the REAMIT project. Kate is waiting to hear back from them.

-Kate is considering approaching an external expert in agri food in the UK who may connect us to more pilot test companies in the UK. Kate needs to ask the funder at Interreg NWE Programme Joint Secretariat if the costs of engaging with an external expert who may be able to help BED find new companies for pilot tests will be considered eligible within the REAMIT project.

**Ongoing action: Kate to contact again the E&Y contact for UK agri food companies asking whether he will agree to have an online meeting with Kate, Ram and Tahmina.**

**Glen Affric Brewery pilot (Sasha-Usha):**

A family owned Brewery, based in Liverpool, UK, producing canning and distributing beer around the country.

- **Starting date:** September 2021
- **Objective:** To minimise wastage during brewing and maintain the highest quality in beer produce, considering factors such as oxygen levels, gravity levels, temperature and yeast content. Ideally, GA would like to have a system to monitor and regulate the beer – where the sugar content, CO2 content, temperature control etc is all optimized. First issue to be solved: knowing when a beer is ready to be canned. To have better knowledge of what is happening on in the fermentation towers.+ the wasted barley is currently given away as food for animals but can be used more effectively.
- **Progress:** -A LORA-WAN Gateway device and one temperature sensor has been installed successfully at Glen Affric by Marco from Whysor.  
 -NTU and Whysor agreed that temperature sensors and flow sensors will be installed at Glen Affric. Whysor are in the process of sourcing these sensors. These are yet to be confirmed with GA (temperature sensors for 2 tanks and flow sensors for 2 or 3 sensors).  
 \*Imke: Another flow meter should be at the end of the fermentation process-still need to discuss with the company. Currently there are only measurements inside fridge to check the connectivity.
- **Next steps:** - Procurement and purchase of sensors- temperature and flow meter  
 -Installation of sensors  
 -Begin data monitoring  
 -In December: to organise a visit to see what else could be done

**Action: Imke to establish contact with the company (technological expert requested).**

**Action: Usha to provide information about a presentation done of the REAMIT project and the useful details contacts gathered.**

**Action: Sasha to purchase sensors for Glen Affric.**

**IRISH PILOT TESTS (Xavier):**

- **Progress:** -On 15 October 2021: meeting with Interreg NEW Ireland's point of contact (Sarah Davoren). She supported UCD in contacting/ broadcasting REAMIT to Enterprise Ireland (including a

previous REAMIT contact), Regional Enterprise offices, Fisheries agency (BIM), Agricultural research agency (Teagasc), Industrial Development Agency.

-On 12 November: Sarah's networking resulted in a contact at MTU suggesting to contact : Aran Island Seafoods (a fish retailer that manages their own transport), sustainable Seafood Ireland+ the marketing division of BIM (state agency) for more information on fish transporters in Ireland.

- **Next steps:** -to contact the above candidates -> Xavier is asking for some tips to contact the companies.  
 -to establish collaboration with REAMIT partners for pilot development, e.g. : Whysor as the technological partner, Ulster University, University of Bedfordshire as lead partner...  
 -Around 15-19 November 2021: meeting will be scheduled with MTU for collaboration.
- **Expected starting date for a pilot test:** Not yet known.

**Ongoing action:** Xavier to add Gautam in the e-mail loop with Sarah.

**Ongoing action:** Xavier to talk with Tahmina (BED) about her research and possible future collaboration.

**Action:** Xavier to contact Kate for an online meeting about how to approach companies in Ireland for REAMIT pilot tests.

**Action:** Xavier to contact Shane and ask him for help in connecting with other relevant people from agri food companies in Ireland.

### ULSTER PILOT TESTS (James):

#### **WD Meats – Dry ageing trial:**

- **Starting date:** 6th July 2021
- **Objective:** To reduce weight and quality lost from beef meat during the dry-aging process by installing temperature and humidity sensors to map readings across chambers.
- **Next steps:** -the next trial could be run early 2022.
- **Issues:** -Marc talked about 'Dark facings', which is unusable meat, occurring when the temperature / humidity is kept too low over the dry ageing process. But if we increase the temperature too much, slime forms on the meat from bacteria and we run the risk of spoiling the entire hindquarter. ->Ideally Marc would like to discover the ideal parameters for the dry ageing process which minimise dark facings while avoids harmful bacteria formulation. There is a statistically significant difference between the front and rear HQ weights due to the refrigeration unit located at the front of the lorry - fluid dynamics?

#### **WD Meats – Clostridium Estertheticum trial:**

- **Objectives:** To strengthen the method of detection allowing for immediate clean up of surfaces when detected and reduced beef waste in abattoirs, retailers and homes.
- **Progress:** -qPCR machine broke down over the summer which delaying ordering of the master mix clostridium kit.  
 -Mastermix kit arrived with UU on 27 October 2021.
- **Next steps:** -Need to source clostridium bacteria with UCD? (exchanges ongoing with James Dooley and his colleagues at UCD).  
 -To ran some clostridium material and calculated minimum level of detection by Christmas

-To have a meeting with Sensipdx to check if their equipment is suitable and if so, are they still willing to collaborate (they were originally approached for the capitalisation call).

- **Expected starting date for a pilot test:** not known.

**Ongoing action: James to schedule a meeting with Sensipdx.**

### **3DF trial:**

- **Objective:** Use 3DF technology to reduce food waste. 3DF sensors can be used to make determinations of total bacterial count on products or liquids.
- **Progress:** One Fresh Detect sensor has been lent to UCD, another one was sent to Tahmina at Beds and Imke also wants to lend one Fresh Detect sensor for a German pilot.
- **Next steps:** -Potential joint collaboration project with Xavier (UCD)  
 -Potential use in the checking of poultry products being delivered to Musgrave Cash and Carry. (communication with Matthias)-testing had been trialed through cellophane, however the cellophane would need to be pressed right against the poultry fillet in order to achieve an accurate reading +the freshdetect needs to be used on a flat surface of the poultry for it to produce accurate readings
- **Expected starting date for the pilot test:** not known.

### **Musgrave trial :**

- **Objective:** to install temperature and humidity sensors and have an alerting system /cloud upload from Musgrave phone which can warn if food is at risk of spoilage.
- **Progress:** -Decided it would be easier to use a cellular IoT temp/humidity sensor like the ones being used for HMF / Yumchop  
 -Marcel has suggested he configures one sensor with temperature/humidity probe with x/y/z detection enabled and send James this plus the programming module so James can repeat the configuration on additional 4 sensors.  
 -Marcel contacted James last week confirming that temperature and humidity data is being logged.
- **Next steps:** -Marcel is working on enabling x/y/z detection.
- **Expected starting date for the pilot test:** end of October 2021.

### **PILOT FRANCE (Ali):**

#### **Routhiau pilot:**

- **Progress:** work ongoing on the automation of Raman measurement for the integration of system in a food truck
- **Next steps:**

+Analysis of fruits from market

**Action: Ali to provide more information about the follow-up of the pilot tests.**

#### **IGRECA pilot:**

- **Progress:** done on IGRECA samples, data available & shared with partners, exploration of data, report sent to IGRECA and Valorial, communication document
- **Next steps:** confirmation of IGRECA + choice of pilot sample

- Expected starting date: ?

**Action:** Kate to signal to Ram that partners from UoN systematically fail to attend WP T1 monthly meetings and fail to share with REAMIT partners information about the progress in the implementation of UoN pilot test. This is a risk for the REAMIT project.

**New pilot test in France:**

**Ongoing action:** Adrienne to approach agri food companies in Valorial's network and check possibilities for developing a new pilot test in France.

**Action:** Gladys to follow-up if Adrienne had any luck to approach brewery companies.

**Action:** Gladys to send the new invitation for the WPT1 Meeting on the 13<sup>th</sup> of December.

**Action:** All pilot leads to invite pilot test companies to attend WP T1 meeting on 19th January 2022, as part of RAC/WP/RSC meetings, and delivering the presentation on the pilot test in which they are involved.



## WP T1 meeting, 13/12/2021

### 11 Participants:

Name	Institution
Imke Hermens	Whysor
Katarzyna Pelc	BED
James Gillespie	UU
Gautam Samriya	ITTRALEE / MTU
Sasha Bennett	NTU
Xavier Cama	UCD
Tamiris da Costa	UCD
Ali Assaf	UoN
Gael Maugis	I&R
Gladys Gallot	I&R

**Absent: Sahar Ahmadzadeh, BED**  
**Usha Ramanathan, NTU**

General information:

**All the presentations with update from pilots to be uploaded under the Sharepoint:**  
**REAMIT Documents > WP T1 Meeting > Slides Meeting 13 December 2021**

### **GENERAL INFORMATION:**

Request from Kate:

#### **Action: @All pilot leads**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a

document will help Kate keep track of progress, needs and challenges in case of each pilot test. Each pilot lead sends this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications. If a Pilot lead is not able to attend this compulsory meeting, this information should be send (to Kate and me) ahead of the meeting.

#### Discussion on the purchase of sensors with Imke and Marcel (Whysor):

There are currently shortages of chipset due to the covid situation, the process to purchase sensors is very lengthy. Marcel and Imke proposed to buy the biggest sensors, the only one available, to speed the things up and to be sure to receive 40 sensors (180 USD per sensor) for the pilot tests with Biogros, Musgrave and HMF.

**Action: Kate to send an email to Ram to get his final agreement.**

#### UK PILOT TESTS (Kate):

##### Human Milk Foundation pilot:

Human Milk Foundation (HMF), founded in 2017 in UK, is a charity working to help more families feed their babies with human milk.

- **Starting date:** July 2021
- **Objective:** to monitor temperature in which human milk is transported between a donor – Human Milk Bank – Hospital/home; and send alerts if these conditions change.
- **Progress:** -BED got green light from Natalie Shenker at HMF to purchase and install 10 new sensors at HMF.  
 -BED invited Natalie Shenker to attend REAMIT WP T1 meeting at RAC/WP/RSC meeting on 19/01/2022.
- **Next steps:** -Data analytics partners (BED, MTU, SenX, Levstone) to specify what else is needed to carry out data analysis of data from 2 sensors at HMF and to carry out data analysis based on data from 2 sensors at HMF (James' document on data analysis).  
 -BED to purchase 10 new sensors for HMF. Whysor to specify which sensors need to be purchased by BED for HMF.  
 -BED to arrange an online meeting with data analytics partners and HMF in January 2022.
- **Point of attention:** Request to include Kate in future email communication with HMF. +Request to be very careful when communicating with HMF (and other pilot test partners) not to upset them and consequently, not to lose them.  
 -Imke asked to have some exchanges with HMF just to clarify matters.
- **Covid related issues:** England is moving to Plan B in response to the risks of the Omicron variant. New restrictions have been implemented: face in most indoor public places and on public transport, tests and self-isolation, work from home recommended since 13 December, need to show [NHS COVID Pass](#) at nightclubs since 15 December, meeting outdoors recommended as well as good ventilation indoor.

**Action: Kate to join a meeting on 14 December with Whysor and Imke to discuss about the sensors to be purchased for HMF.**

### **Yumchop pilot:**

UK based company selling frozen food ready to eat (warm food in microwave)

- **Starting date:** 21 December 2020
- **Objectives:** 1-To ensure that frozen food is stored in the right temperature in the Yumchop food factory. 2-To ensure that frozen food is transported in the right temperature from Yumchop food factory to where vending machines are located (e.g. NHS hospitals) or to private homes (Yumchop home delivery service). 3-To provide food fingerprint (i.e. data on the condition in which food produced by Yumchop has been stored and transported).
- **Progress:** -On 18 November 2021, an online meeting on 'REAMIT Dashboard for Yumchop' took place, organised by Whysor and attended by Abi Adefisan and Michael Adefisan from Yumchop, Whysor and BED. \*the dashboard for Yumchop shows temperature in all zones where sensors have been installed (below -15 degrees C (or higher) two times in a row, an alert is triggered).  
 \*Abi also confirmed that they set up their freezer at -24 degrees C; and that they do not need temperature at -30 degrees C. Too low temperature means too much energy consumption for Yumchop.  
 - Positive feedback received from Abi Adefisan: all sensors installed at Yumchop's food factory worked well. Temperature in one freezer raised from -30 degrees C to -15 degrees C. This lasted for some hours and the sensor did not pick up on it. The temperature dropped again to -20 degrees C.  
 On 10 December 2021, an online meeting took place, which focused on 'LCA' and 'Case Study', attended by Tamiris and Kate.  
 - Imke made a weekly report for one of the sensor located in the freezer. She will also do the same for every sensor, which will provide useful data for the company to be used daily for legislation matter for ex.
- **Point of attention:** to approach the company carefully not to scare them as they seem relatively unprepared during the last meeting. Kate's suggestions: to send questions to them in advance, to split questions in smaller chunks.
- **Next steps:** -Yumchop would like to access the dashboard and e.g. modify it according their needs.  
 -On 16 December 2021, an online meeting on 'REAMIT Dashboard' is scheduled, organised by Whysor for all the REAMIT partners using the dashboard. .

**Action:** Imke to send credentials to Yumchop and check if Michael can get the rights to change his own dashboard.

### **Blue Skies pilot:**

Company in Bedfordshire, UK producing fresh food, cut where produced and then sent to the UK.

- **Objective:** to monitor temperature in containers in which fresh food is stored during transit by plane from overseas locations in Brazil, South Africa, etc. to UK.
- **Progress:** Blue Skies is interested to go ahead with the pilot test.
- **Next step:** a first meeting with Whysor will be scheduled soon.

### **PILOT NETHERLANDS:**

#### **Picnic pilot:**

- **Starting date:** November 2020

- **Progress:** \*icepacks used for cooling have been added to the architecture prepared by Whysor.
  - On 3 December 2021, a meeting with Frank Vollerling, data scientist Picnic and Thom Groothuis for data requirements took place.
  - The work on the video with Sasha and Frank Gorte is ongoing.
  - New sensors were assembled with flexible rings (tested at Whysor what is the best way to stick them in the box.).
  - On 8 December 2021, eventually sensors arrived at Picnic (the sensors were not available before)
- **Next steps:** On 24 December 2021, a meeting is planned to install the new sensors. Data are expected from that date on, and will be then sent to partners for analyse.
  - to set the cooling profile per coolbox.
  - The data scientist at Picnic is working on a non-disclosure agreement.
- **COVID-19 related issues:** Infection numbers are still very high; 3 weeks more for the lockdown and work from home is highly recommended.

#### **BIOGROS pilot (Luxembourg):**

Supplier of high-quality organic food

- **Starting date:** November 2021.
- **Objective:** to gain insight on the climatic conditions (temperature and humidity) through the complete supply chain (trucks, warehouse, grower) for several fragile vegetables (mushrooms, onions, potatoes, celery root).
- **Progress:** -On 16 November, sensors arrived at BIOGROS  
 -On 6 December, sensor '8464' was placed inside a truck and sensor '7643' was placed inside the BIOGROS coldstore. Sensor 8464 will stay inside the truck for a few weeks to test the connectivity during several trips. Sensor 7643 will be placed in different coldstores to test the connectivity.
- **Next step:** -to define what sensors to order, to order the sensors (issues with the delivery-hopefully we can get them in February) and then make the calibration and install them in Luxembourg in February.

#### **Van de Huijgevoort Groep pilot (The NL):**

Bread, salads and meat processing company for cold cuts and semi-finished products (chicken for salads, minced meat for sausage roll)

- **Objectives:** **1** - to shorten the checks process on the presence of bacteria (listeria, salmonella) and avoid quality product loss (due to freezing and thawing) **2**-to check the production room pressure
- **Progress:** -nothing to report this month.
- **Next steps:** -On 12 January 2022, a meeting is scheduled with the quality manager to define the use case for measurements of overpressure.
- **Expected starting date:** still to be determined

#### **Landgard (new pilot test in Germany):**

Landgard is a producer cooperative for flowers and plants, fruit and vegetables in Germany delivering fruit and vegetables from Germany and Europe on a daily basis.

- **Next steps:** On 20 December 2021, a first meeting with Marion Schweckhorst, quality and sustainability manager will take place.

#### ULSTER PILOT TESTS (James):

##### **WD Meats – Dry ageing trial:**

- **Starting date:** 6 July 2021
- **Objective:** To reduce weight and quality lost from beef meat during the dry-aging process by installing temperature and humidity sensors to map readings across chambers.
- **Next steps:** -the next trial could be run early 2022.
- **Issues:** -Marc talked about 'Dark facings', which is unusable meat, occurring when the temperature / humidity is kept too low over the dry ageing process. But if we increase the temperature too much, slime forms on the meat from bacteria and we run the risk of spoiling the entire hindquarter. ->Ideally Marc would like to discover the ideal parameters for the dry ageing process which minimise dark facings while avoids harmful bacteria formulation. There is a statistically significant difference between the front and rear HQ weights due to the refrigeration unit located at the front of the lorry - fluid dynamics?

##### **WD Meats – Clostridium Estertheticum trial:**

- **Objectives:** To strengthen the method of detection allowing for immediate clean up of surfaces when detected and reduced beef waste in abattoirs, retailers and homes.
- **Progress:** -qPCR machine broke down over the summer which delaying ordering of the master mix clostridium kit.-Mastermix kit arrived with UU on 27 October 2021.
- **Next steps:** -Need to source clostridium bacteria with UCD? (exchanges ongoing with James Dooley and his colleagues at UCD).  
 -To run some clostridium material and calculated minimum level of detection by Christmas  
 -To have a meeting with Sensipdx to check if their equipment is suitable and if so, are they still willing to collaborate (they were originally approached for the capitalisation call).  
 ->to contact again James. To confirm with James if we can progress in this trial.
- **Expected starting date for a pilot test:** not known.

**Ongoing action:** James to schedule a meeting with Sensipdx.

##### **3DF trial:**

- **Objective:** Use 3DF technology to reduce food waste. 3DF sensors can be used to make determinations of total bacterial count on products or liquids.
- **Progress:** One Fresh Detect sensor has been lent to UCD, which has now been lent to Imke, One Fresh Detect has been lent to Tahmina at BED.

- **Next steps:** -On 17 December 2021, a meeting is planned with Matthias to discuss use of FreshDetect for project (for Salmonella, Listeria, etc.).
- **Expected starting date for the pilot test:** not known.

#### **Musgrave trial:**

- **Objective:** to install temperature and humidity sensors and have an alerting system /cloud upload from Musgrave phone which can warn if food is at risk of spoilage.
- **Progress:** -Marcel and Marco worked with device manufacturer to enable x/y/z detection for autonomous alerting system avoiding driver/ logistics staff intervention.  
-On 10 December, sensor and programming module arrived.
- **Next steps:** -to organise a meeting with Imke, Marco, and Marcel to test sensor, ensuring cellular recording works in Belfast and how to translate accelerometer data to Whysor architecture.
- **Expected starting date for the pilot test:** still to be determined.

#### **IRISH PILOT TESTS (Xavier):**

- **Progress:** -On 19 November 2021: meeting conducted among the UCD and MTU teams (Gerard Corkery, Pat Doody, Gautam Samriya, Shane Ward, Xavier Cama). The team will focus on delivering the POC, Fresh Box inspired, trials.  
-At the end of November, the following BiOrbic Research Centre's industrial contacts were approached via email: Glanbia, Monaghan Mushrooms, NVP energy, Nutramara/HJL Scientific, Nuritas, Carbery, Adesco, Dulra Marine, This is Seaweed. ->No answer so far.  
-Several others businesses and people suggested by Sarah Davoren's were approached: Aran Islands Seafood, Ian Marshall, Sustainable Seafood Ireland, Sam Dennigans ->no positive answer so far.  
-On 13 December 2021, John Reilly (Sligo Enterprise) proposed a potential fruit and vegetable company which could be interested. ->to approach them soon.  
-On 15 November 2021, Fresh Detect system has been shipped to Whysor.  
Possible collaborations between UU and UCD has been explored.
- **Next steps:** -to continue the work ongoing to approach and recruit companies.
- **Expected starting date for a pilot test:** waiting for the sensors, after Christmas break, should be able to start.
- **COVID-19 related issues:** the number of cases is growing. New restrictions have been put in place affecting indoor gatherings, such as the number of people allowed per table in pubs and restaurants, closure of nightclubs, and venue attendance limit for sports and cultural events. People are requested to work from home wherever possible.

**Ongoing action: Xavier to add Gautam in the e-mail loop with Sarah.**

**Ongoing action: Xavier to talk with Tahmina (BED) about her research and possible future collaboration.**

#### **Glen Affric Brewery pilot (Sasha-Usha):**

A family owned Brewery, based in Liverpool, UK, producing canning and distributing beer around the country.

- **Starting date:** September 2021

- **Objective:** To minimise wastage during brewing and maintain the highest quality in beer produce, considering factors such as oxygen levels, gravity levels, temperature and yeast content. Ideally, GA would like to have a system to monitor and regulate the beer – where the sugar content, CO2 content, temperature control etc is all optimized. First issue to be solved: knowing when a beer is ready to be canned. To have better knowledge of what is happening on in the fermentation towers.+ the wasted barley is currently given away as food for animals but can be used more effectively.
- **Progress:** -Dan has met with Imke for the configuration of the sensors.
- **Next steps:** -to discuss with Marcel from Whysor,  
 -Procurement and purchase of sensors- temperature and flow meter  
 -Installation of sensors  
 -Begin data monitoring  
 -In December: to organise a visit to see what else could be done

**Action: Sasha to purchase sensors for Glen Affric.**

#### **PILOT FRANCE (Ali):**

##### **Routhiau pilot:**

- **Progress:** Automation of the analysis, and development of algorithm for the selection of “interesting areas” (motorised stage for automatic analysis) : -integration of Rama system in cold room (real condition).
- **Next steps:** -to complete the automation of the analysis (February 2022)  
 -to define the algorithm for the selection of “interesting areas” (February 2022).  
 -to start the integration/test in real conditions with Routhiau (May-June 2022).  
 -to find new pilots (with the help of I&R and Valorial).

##### **IGRECA pilot:**

- **Progress:** done on IGRECA samples, data available & shared with partners, exploration of data, report sent to IGRECA and Valorial, communication document
- **Next steps:** UoN is waiting for an answer from IGRECA to continue the work.
- **Expected starting date:** ?

**Action: Ali to provide updates for the newsletter (to Sasha) by the end of this week.**

**Action: Gautam to send an e-mail to Kate about the companies interested by the pilot tests with whose he is in contact.**

**Action: All pilot leads to invite pilot test companies to attend WP T1 meeting on 19th January 2022, as part of RAC/WP/RSC meetings, and delivering the presentation on the pilot test in which they are involved.**

## WP T1 meeting, 17 January 2022

### 11 Participants:

Name	Institution
Imke Hermens	Whysor
Katarzyna Pelc	BED
James Gillespie	UU
Gautam Samriya	ITTRALEE / MTU
Sasha Bennett	NTU
Xavier Cama	UCD
Tamiris da Costa	UCD
Gladys Gallot	I&R

**Absent: Sahar Ahmadzadeh, BED**

**Usha Ramanathan, NTU**

**Ali Assaf, UoN**

General information:

All the presentations with update from pilots to be uploaded under the Sharepoint:

**REAMIT Documents > WP T1 Meeting > Slides Meeting 17 January 2022**



## **GENERAL INFORMATION:**

### Request from Kate:

#### **Action: @All pilot leads**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot lead sends this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.

If a Pilot lead is not able to attend this compulsory meeting, this information should be send (to Kate and me) ahead of the meeting.

### ULSTER PILOT TESTS (James):

#### **WD Meats – Dry ageing trial:**

- **Starting date:** 6 July 2021
- **Objective:** to reduce weight and quality lost from beef meat during the dry-aging process by installing temperature and humidity sensors to map readings across chambers.
- **Next steps:** - the next trial could be run early 2022. No update since December, lack of staff for research tasks during the Christmas period.
- **Issues:** - to discover the ideal parameters for the dry ageing process which minimise dark facings while avoids harmful bacteria formulation. There is a statistically significant difference between the front and rear HQ weights due to the refrigeration unit located at the front of the lorry - fluid dynamics?

#### **WD Meats – Clostridium Estertheticum trial:**

- **Objectives:** To strengthen the method of detection allowing for immediate clean up of surfaces when detected and reduced beef waste in abattoirs, retailers and homes.
- **Progress:** -qPCR machine broke down over the summer which delaying ordering of the master mix clostridium kit.-Mastermix kit arrived with UU on 27 October 2021 but this not yet possible to perform the test.
- **Next steps:** -Need to source clostridium bacteria – James Dooley has spoken to UCD about this but unfortunately the one member of staff who knows the clostridium location in the freezer is off sick at present (not clear when this will be resolved, James will contact them again on 17 January 2022).  
-Once we the minimum level of detection will be calculated, need to have a meeting with Sensipdx: to check if their equipment is suitable and if so are they still willing to collaborate/how can we incentivise them? (they were originally approached for the capitalisation call).
- **Expected starting date for a pilot test:** not known

**Ongoing action: James to schedule a meeting with Sensipdx.**

**3DF trial:**

- **Objective:** Use 3DF technology to reduce food waste. 3DF sensors can be used to make determinations of total bacterial count on products or liquids.
- **Progress:** One Fresh Detect sensor has been lent to UCD, which has now been lent to Imke, One Fresh Detect has been lent to Tahmina at BED.  
 -On 17 December 2021, meeting organised with Matthias to discuss the use of FreshDetect for VDH project (for Salmonella, Listeria, etc.)- agreed after consultation that this is outside of the scope of the REAMIT project.
- **Next steps:** -to decide if these activities should be pursued considering Freshdetect is not 3D.  
 -to talk to other companies to find appropriate device for 3DF technologies.
- **Expected starting date for the pilot test:** not known.

**Continuation/other trial opportunity:**

- Discussion initiated with Xavier (UCD) to more fully understand the FreshDetect/ Spectroscopy technology and discussed potential use cases within the REAMIT project
- Exchange with Matthias about the potential use in the checking of poultry products being delivered to Musgrave Cash and Carry. Some testing had been trialed through cellophane, however the cellophane would need to be pressed right against the poultry fillet in order to achieve an accurate reading + the Freshdetect needs to be used on a flat surface of the poultry for it to produce accurate readings.
- Need a FreshDetect returned to James for testing to validate the potential of this trail (how long does it actually take for TVC to increase when chicken is left at room temperature?)

**Action: James to get in touch with Ram to discuss whether this pilot should be pursued and if not to find other companies.**

**Action: James to contact Imke to see if a FreshDetect could be returned to him.**

**Musgrave trial :**

- **Objective:** to install temperature and humidity sensors and have an alerting system /cloud upload from Musgrave phone which can warn if food is at risk of spoilage.
- **Progress:** -James checked the sensor and programming module which arrived on 10 December. The cellular recording are working fine in Belfast and recording are being made every 5 minutes.  
 -4 further Eagle loggers have been ordered from South Africa and arrived at Whysor + James ordered 4 temp/humidity probes from Farnell to wire into these loggers when they will arrive in Belfast.  
**Next steps:** -Marco (Whysor) is working on trip detection algorithm using accelerometer data logged by the Eagle device to trigger when the trip has commenced and ended (this will be also used to improve the battery life of the logger using 'sleep/wake' information).  
 -Accelerometer reporting has been added to the REAMIT test environment and is undergoing testing (expecting in production soon).
- **Expected starting date:** February 2022.

**PILOT NETHERLANDS:**

**Van de Huijgevoort Groep pilot (The NL):**

Bread, salads and meat processing company for cold cuts and semi-finished products (chicken for salads, minced meat for sausage roll)

- **Objectives:** 1- to shorten the checks process on the presence of bacteria (listeria, salmonella) and avoid quality product loss (due to freezing and thawing) 2-to check the production room pressure
- **Progress:** -FreshDetect sensors are not suitable to test salmonella.  
 -On 12 January 2022, a meeting with the quality manager from VDHG was organised to discuss about the measurements of listeria, the hygiene protocol, the measurements of overpressure, the best before date. According to legislation there is no other option allowed to check listeria.
- **Next steps:** -On 18 January 2022, a meeting is scheduled with VDHG to talk about other options to explore within the scope of the REAMIT project – good contact with the company which is very supportive.
- **Expected starting date:** still to be determined

**Action:** James and Imke to discuss with Ram the possibility of using the FreshDetect sensors in another way as for instance to the best before date measurements.

**Picnic pilot:**

- **Starting date:** November 2020
- **Progress:** -On 24 December 2021, a meeting was organised with Picnic to install the sensors.  
 -10 sensors have been installed (20 received but only 10 installed). 8 sensors are currently still working but 2 are broken or have bad reception (Tom is looking into it).
- **Next steps:** -the company has asked for a non-disclosure agreement  
 -to analyse the data collected  
 -to determine the cooling profile per coolbox.
- **COVID-19 related issues:** Hard lockdown from 20 December 2021 until 15 January 2022. Schools and stores have reopened (with adjusted opening hours). Maximum 4 visitors per day is authorised. Remote work is recommended when possible. Infection rates are increasing, but hospital admission rates are dropping.

**Action:** Imke to get in touch with Kate about the NDA requested.

**BIOGROS pilot (Luxembourg):**

Supplier of high-quality organic food

- **Starting date:** November 2021.
- **Objective:** to gain insight on the climatic conditions (temperature and humidity) through the complete supply chain (trucks, warehouse, grower) for several fragile vegetables (mushrooms, onions, potatoes, celery root).

- **Progress:** -2 sensors have been sent to them in November and they have started tests in December (one of the sensor is inside a truck and the 2<sup>nd</sup> at a grower (and every week they send the sensor to a grower to check the connectivity in Luxembourg).  
 -Connectivity tests have been completed  
 -1 of the sensors ran out of battery  
 -15 loggers “Eagle” from manufacturer Digital Matter have been purchased and arrived at Whysor
- **Next step:** -15 RV/T sensors have to be purchased.  
 -calibration of sensors and installation in Luxembourg.  
 -on 1 February 2022, an online meeting is scheduled with Biogros.

#### **Landgard (new pilot test in Germany):**

Landgard is a producer cooperative for flowers and plants, fruit and vegetables in Germany delivering fruit and vegetables from Germany and Europe on a daily basis. *Landgard experiences difference in quality of product (vegetables) between producers. Producer 1 and producer 2 both produce the same product. Producer 1 delivers a product with no quality issues. Producer 2 delivers a product with quality issues.*

- **Objective:** to investigate the cause of the quality difference in the same product between two different growers and thus reduce food waste with the product of producer 2.
- **Next steps:** to have a visit at the premises soon.

#### **UK PILOT TESTS (Kate):**

##### **Human Milk Foundation pilot:**

Human Milk Foundation (HMF), founded in 2017 in UK, is a charity working to help more families feed their babies with human milk.

- **Starting date:** July 2021
- **Objective:** to monitor temperature in which human milk is transported between a donor – Human Milk Bank – Hospital/home; and send alerts if these conditions change.
- **Progress:** -on 17 January 2022 an online meeting was held with HMF. They confirm they want a fresh start in 2022 and to not reopen the complaints.  
 -Natalie Shenker (HMF) confirmed her attendance at RAC/WP/RSC meeting on 19/01/2022.  
 -On 14 January 2022 an online meeting of REAMIT data analytic partners was organised for HMF to discuss the approach (HMF seemed impressed with what they can expect from REAMIT).
- **Next steps:** -Data analytics of data for HMF  
 -to improve the IoT approach  
 -to purchase 20 sensors with Whysor (Imke will sent again an e-mail to Kate about this).  
 -to deal with the short battery life – Marco from Whysor is looking for a solution.
- **Point of attention:** Request to include Kate in future email communication with HMF. +Request to be very careful when communicating with HMF

- **Covid related issues:** work from home recommended since 13 December, need to show NHS COVID Pass at nightclubs since 15 December, meeting outdoors recommended as well as good ventilation indoor.

#### **Yumchop pilot:**

UK based company selling frozen food ready to eat (warm food in microwave)

- **Starting date:** 21 December 2020
- **Objectives:** **1-**To ensure that frozen food is stored in the right temperature in the Yumchop food factory. **2-**To ensure that frozen food is transported in the right temperature from Yumchop food factory to where vending machines are located (e.g. NHS hospitals) or to private homes (Yumchop home delivery service). **3-**To provide food fingerprint (i.e. data on the condition in which food produced by Yumchop has been stored and transported).
- **Progress:** -On 10 December 2021 an online meeting was organised focused on LCA with Kate and Tamiris- it did not go well since the company was surprised by the level of details we are asking.  
 -no data is coming from Yumchop, the last measurement was done on 14 January around 12:12- Imke guess there is a problem with the gateway (not a problem with the sensors)  
 -no news if they will attend RAC/WP/RSC meeting on 19 January 2022.  
 -Imke have put in place weekly report for every freezer and is interested to talk with them about the usability of the dashboard.
- **Point of attention:** to approach the company carefully not to scare them as they seem relatively unprepared during the last meeting. Kate's suggestions: to send questions to them in advance, to split questions in smaller chunks. Monthly meeting are not a good idea. We need to find the best approach to get the information from them.
- **Next steps:** -Yumchop would like to access the dashboard and e.g. modify it according their needs.  
 -on 21 January 2022 a meeting is scheduled on LCA (Usha will attend as well).  
 -to improve the accessibility of the dashboard (through an app?!)  
 -to start data analytics

**Ongoing action:** Imke to follow-up on Yumchop dashboard and weekly report and check if Michael can get the rights to change his own dashboard.

**Action:** Tamiris to send a message to Abi to ask if she knows what happen since no data is coming since the 14th of January and if she is experiencing difficulties in using the dashboard.

**Action:** Kate to invite them again to the RAC/WP/RSC meeting on 19 January 2022.

#### **Blue Skies pilot:**

Company in Bedfordshire, UK producing fresh food, cut where produced and then sent to the UK.

- **Objective:** to monitor temperature in containers in which fresh food is stored during transit by plane from overseas locations in Brazil, South Africa, etc. to UK.
- **Progress:** beginning of January a meeting was organised with them. Blue Skies is interested to go ahead with the pilot test. They will send us some videos on how the company looks like, where the

containers are at the airport in Heathrow and in Ghana (where the situation (temperature) of the food will be measure.

- **Next step:** -Whysor to have a look at the video once received and decide the best location for the sensors; to establish the NDA requested by the company.

### **Glen Affric Brewery pilot (Sasha):**

A family owned Brewery, based in Liverpool, UK, producing canning and distributing beer around the country.

- **Starting date:** September 2021
- **Objective:** To minimise wastage during brewing and maintain the highest quality in beer produce, considering factors such as oxygen levels, gravity levels, temperature and yeast content. Ideally, GA would like to have a system to monitor and regulate the beer – where the sugar content, CO2 content, temperature control etc is all optimized. First issue to be solved: knowing when a beer is ready to be canned. To have better knowledge of what is happening on in the fermentation towers.+ the wasted barley is currently given away as food for animals but can be used more effectively.
- **Progress:** On 6 January a meeting was held with JUMO, Whysor and NTU about the selection of sensors to be used for brewing process, their position as well as the purchasing.  
 -Jumo, which is one of the leading manufacturers in the field of industrial sensor and automation technology, have offered a temperature sensor and a thermowell (they do not sell clamp-on flow sensors).  
 -On mid-January Marco and Imke had a follow-up meeting with Job Joosten from JUMO regarding the quotation.  
 -No answer received yet from them regarding the RAC/WP/RSC meeting on 19 January 2022.
- **Next steps:**  
 -Procurement and purchase of sensors- temperature, flow meter and thermowell by NTU (waiting for confirmation from Trevor and Lucio (GA)).  
 -Installation of sensors  
 -Begin data monitoring

**Ongoing action: Sasha to purchase sensors for Glen Affric.**

### **IRISH PILOT TESTS (Xavier):**

- **Expected starting date for pilot/ testing:** due to start soon (pilot/testing duration: 2 months) with the associated partner Munster Technological University.
- **Objectives:** to demonstrate the viability of the proposed pilot and to gain knowledge on both strengths and limitations + to produce results/ outputs that can be shown to companies to establish partnerships.
- **Progress:** -currently focusing on delivering the proof of concept (inspired by Fresh Box idea)

-the data logger and the box have been purchased and the vehicle will be soon (to confirm UCD vehicle availability with UCD transport team).

- **Next steps:** -to continue the work on delivering proof of concept/ focusing to get the fresh box up and running.
- **Recruitment of companies:** no feedback have been received from the companies contacted early December. Beginning of January other companies have been contacted suggested by Sarah Davoren's. In total 23 companies have been approached without any success.
- **COVID-19 related issues:** the restrictions put in place in December are still in effect affecting indoor gatherings such as the number of people allowed per table in pubs and restaurants, closure of nightclubs, and venue attendance limit for sports and cultural events. People are requested to work from home wherever possible.

**Ongoing action: Xavier to add Gautam in the e-mail loop with Sarah.**

**Ongoing action: Xavier to talk with Tahmina (BED) about her research and possible future collaboration.**

**PILOT FRANCE (Ali):**

**Routhiau pilot:**

- **Progress:** Automation of the analysis, and development of algorithm for the selection of "interesting areas" (motorised stage for automatic analysis): -integration of Rama system in cold room (real condition).
- **Next steps:** -to complete the automation of the analysis (February 2022)  
 -to define the algorithm for the selection of "interesting areas" (February 2022).  
 -to start the integration/test in real conditions with Routhiau (May-June 2022).  
 -to find new pilots (with the help of I&R and Valorial).

**IGRECA pilot:**

- **Progress:** done on IGRECA samples, data available & shared with partners, exploration of data, report sent to IGRECA and Valorial, communication document  
 ->the company is no longer willing to pursue the pilot test.
- **Next steps:**
- **Expected starting date:** ?

**Action: Ali to provide more details on the pilot tests.**

**Other opportunity (Gautam):**

Gautam had a meeting with the co-founder of FoodCloud (non charity organisation taking food from larger scale producers and redistribute it to other locations where it could be more useful). They were interested in future collaborations with the REAMIT project.

**Ongoing action: Gautam to send an e-mail to Kate about the companies interested by the pilot tests with whose he is in contact.**

**Ongoing action: All pilot leads to invite pilot test companies to attend WP T1 meeting on 19th January 2022, as part of RAC/WP/RSC meetings, and delivering the presentation on the pilot test in which they are involved.**



## WP T1 meeting, 21/02/2022

### 11 Participants:

Name	Institution
Imke Hermens	Whysor
Katarzyna Pelc	BED
Sahar Ahmadzadeh	BED
James Gillespie	UU
Gautam Samriya	ITTRALEE / MTU
Sasha Bennett	NTU
Xavier Cama	UCD
Tamiris da Costa	UCD
Omar Dib	UoN
Gaël Maugis	I&R
Gladys Gallot	I&R

### Absent:

**Usha Ramanathan, NTU**

**Ali Assaf, UoN**

General information:

All the presentations with update from pilots to be uploaded under the Sharepoint:

**REAMIT Documents > WP T1 Meeting > Slides Meeting 21 February 2022**

## **GENERAL INFORMATION:**

Request from Kate:

### **Action: @All pilot leads**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot lead sends this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.

If a Pilot lead is not able to attend this compulsory meeting, this information should be send (to Kate and me) ahead of the meeting.

## **IRISH PILOT TESTS (Xavier):**

- **Expected starting date for pilot/ testing:** due to start soon (pilot/testing duration: 2 months) with the associated partner Munster Technological University.
- **Objectives:** to demonstrate the viability of the proposed pilot and to gain knowledge on both strengths and limitations + to produce results/ outputs that can be shown to companies to establish partnerships.
- **Progress:** -currently focusing on delivering the proof of concept (inspired by Fresh Box idea)

-the data logger and the box have been purchased and the vehicle will be soon (to confirm UCD vehicle availability with UCD transport team).

- **Next steps:** -to continue the work on delivering proof of concept/ focusing to get the fresh box up and running (not working very well when temperature is too cold – ideally: to have the box filled in with ice blocks to simulate transportation of meats)
- **Recruitment of companies:** no feedback have been received from the companies contacted early December. Beginning of January other companies have been contacted suggested by Sarah Davoren's. In total 23 companies have been approached without any success. Some talks have been initiated with Sligo (but no response then) and other talks are ongoing with Burns Meats (first exploration meeting scheduled on 21 February 2022 – UCD invited Ulster and BED to assist at the meeting).

- **COVID-19 related issues:** most of the restrictions are lifted right now.

**Action:** Xavier to tell Kate the type of sensor needed (with Imke in copy) for the POC pilot test.

#### ULSTER PILOT TESTS (James):

##### **WD Meats – Dry ageing trial:**

- **Starting date:** 6th July 2021
- **Objective:** To reduce weight and quality lost from beef meat during the dry-aging process by installing temperature and humidity sensors to map readings across chambers.
- **Next steps:** -the next trial could be run in March 2022 –had to deep clean the chambers in February (James is in contact with Marc to see when this can happen).  
 +Marc to suggest different structuring of carcass's/sensors after findings from trial before running experiment again to see effects?!
- **Issues:** -to discover the ideal parameters for the dry ageing process which minimise dark facings while avoids harmful bacteria formulation. There is a statistically significant difference between the front and rear HQ weights due to the refrigeration unit located at the front of the lorry - fluid dynamics?

##### **WD Meats – Clostridium Estertheticum trial:**

- **Objectives:** To strengthen the method of detection allowing for immediate clean up of surfaces when detected and reduced beef waste in abattoirs, retailers and homes.
- **Progress:** -qPCR machine broke down over the summer 2021 which delaying ordering of the master mix clostridium kit.
- -Mastermix kit arrived with UU on 27 October 2021 but it has not yet been possible to perform the test.  
 -Clostridium bacteria source at UCD was dead. James Dooley provided James G. with links to order clostridium DNA from a microbiology company in Germany. Company states that you need to provide letter headed paper as proof of identity when placing first order. Ulster are awaiting reply to query on this. Account verified.
- **Next steps:**
- -Need to source clostridium bacteria  
 -Once we have the CB, the minimum level of detection will be calculated, and Ulster will need to have a meeting with Sensipdx: to check if their equipment is suitable and if so are they still willing to collaborate/how can we incentivise them? (they were originally approached for the capitalisation call).

- **Expected starting date for a pilot test:** not known

**Ongoing action: James to schedule a meeting with Sensipdx.**

### **3DF trial:**

- **Objective:** Use 3DF technology to reduce food waste. 3DF sensors can be used to make determinations of total bacterial count on products or liquids.
- **Progress:** One Fresh Detect sensor has been lent to UCD, which has now been lent to Imke, One Fresh Detect has been lent to Tahmina at BED.  
 -On 17 December 2021, meeting organised with Matthias to discuss the use of FreshDetect for VDH project (for Salmonella, Listeria, etc.)- agreed after consultation that this is outside of the scope of the REAMIT project.
- **Next steps:** -to decide if these activities should be pursued considering Freshdetect is not 3D.  
 -to talk to other companies to find appropriate device for 3DF technologies.
- **Expected starting date for the pilot test:** not known.
- **Continuation/other trial opportunity:**  
 -Discussion initiated with Xavier (UCD) to more fully understand the FreshDetect/ Spectroscopy technology and discussed potential use cases within the REAMIT project  
 -Potential use in the checking of poultry products being delivered to Musgrave Cash and Carry. ->Matthias confirmed that some testing had been trialed through cellophane, however the cellophane would need to be pressed right against the poultry fillet in order to achieve an accurate reading +the freshdetect needs to be used on a flat surface of the poultry for it to produce accurate readings  
 -Jipsy has already tried a similar trial with FreshDetect on packaged chicken with unconvincing results  
 -James spoke to Matthias about reusing the FreshDetect on commercial kitchen surfaces, such as these at VHG (Dutch company recruited by Whysor). He said that the reflective properties of steel countertops could cause issue. Some exploratory work carried out on a conveyer belt setup in Denmark. University of Bonn was also researching similar.  
 -Tahmina suggested an online meeting with Matthias, Ulster and BED to discuss this idea further.  
 - Ram thinks that FreshDetect sensor may not be suitable (helpful) for the WD Meats and VHG pilot tests and suggested that Ulster look for a different solution.  
 - Ulster was planning to recruit another researcher specializing in 3DF sensors. This has been put on hold until we receive formal confirmation from JS of the REAMIT 12-months extension budget.

### **Musgrave trial:**

- **Objective:** to install temperature and humidity sensors and have an alerting system /cloud upload from Musgrave phone which can warn if food is at risk of spoilage.
- **Progress:** -James checked the sensor and programming module which arrived on 10 December 2021. The cellular recording are working fine in Belfast and recording are being made every 5 minutes.  
 -4 further Eagle loggers have been ordered from South Africa and arrived at Whysor + James ordered 4 temp/humidity probes from Farnell to wire into these loggers when they will arrive in Belfast.  
 -The 4 sensors arrived on 4<sup>th</sup> February 2022, and 4 loggers arrived on 9<sup>th</sup> February 2022.

**Next steps:** -Marco (Whysor) is working on trip detection algorithm using accelerometer data logged by the Eagle device to trigger when the trip has commenced and ended (this will be also used to improve the battery life of the logger using 'sleep/wake' information).

-Accelerometer reporting has been added to the REAMIT test environment and is undergoing testing (expecting in production soon). When no trip is detected, recordings are made every hour and uploaded to the cloud every 12 hours. When accelerometer detects a trip data is recorded and uploaded every 5 minutes.

-Next meeting in person is scheduled on 28<sup>th</sup> February 2022 with Musgrave (was cancelled on 21<sup>st</sup> February 2022 due to the storm Eunice). The sensors will be also installed at this meeting.

- **Expected starting date:** February 2022.

### UK PILOT TESTS (Kate):

#### **Human Milk Foundation pilot:**

Human Milk Foundation (HMF), founded in 2017 in UK, is a charity working to help more families feed their babies with human milk.

- **Starting date:** July 2021
- **Objective:** to monitor temperature in which human milk is transported between a donor – Human Milk Bank – Hospital/home; and send alerts if these conditions change.
- **Progress:** -on 21/02/2022, 12 loggers have been purchased by Whysor and shipped from Whysor to BED (BED has not received the invoice yet).  
 -BED is also in the process of purchasing 12 temperature and humidity sensors from a UK supplier (finance at BED approved the purchase on 19/02/2022).  
 -Levstone have proposed a Blue Maestro system and solution for HMF. On 15/02/2022, a meeting took place with Davider Bola (Levstone) in Luton.  
 -Blue Maestro sensor and system is now being tested at BED (by Tahmina, Sahar and Kate) before it can be offered to HMF.  
 -Manual for Blue Maestro sensor and system – to be developed during the testing process by BED team, to facilitate installation of sensors at HMF.
- **Next steps:** -BED to purchase binary sensors (to be suggested by Ulster), which will be then attached to the 12 sensors in HMF milk bags.  
 -to finalise the purchase of the sensors, the transport and then to deliver all the loggers to Sahar who will wire them.  
 -to schedule a visit at HMF (attended by Sahar, Tamiris, James, Sasha and Kate) when sensors will be arrived in order to install sensors. (if other partners are interested in participating in the visit at HMF, please let Kate know)
- **Issue:** is the system working well currently?
- **Point of attention:** Request to include Kate in future email communication with HMF.  
 +Request to be very careful when communicating with HMF

- **Covid related issues:** Prime Minister will set out a new plan for living with Covid in UK this week: all regulations that restrict public freedoms should be repealed and vaccines and other pharmaceutical interventions will continue as first line of defense. Meetings are taking place again at the BED and people are encouraged to go back to work.

**Action: Kate to send a doodle to set a date for the visit of HMF and then propose to Nathalie (once the sensors have arrived at BED).**

**Yumchop pilot:**

UK based company selling frozen food ready to eat (warm food in microwave)

- **Starting date:** 21 December 2020
- **Objectives:** **1-**To ensure that frozen food is stored in the right temperature in the Yumchop food factory. **2-**To ensure that frozen food is transported in the right temperature from Yumchop food factory to where vending machines are located (e.g. NHS hospitals) or to private homes (Yumchop home delivery service). **3-**To provide food fingerprint (i.e. data on the condition in which food produced by Yumchop has been stored and transported).
- **Progress:** - Whysor confirmed that Abi, Michael and Francis have permissions for altering the alerts on their dashboard. They all have the right permissions to change things by themselves.
  - Weekly reports are generated by Whysor for each fridge and freezer at Yumchop.
  - 4 Placement opportunities at Yumchop advertised on REAMIT website and social media (Marketing Executives, Production Support Analyst, Production Support, Marketing Creative Assistant).
  - On 21/02/2022 and internal meeting took place of data analytics partners, focused on data analysis for Yumchop.
  - In January 2022, Abi received an alert for one of the freezers. ->Imke thinks that maybe the sensors are not installed correctly as temperature measurements of the fridge give other temperature than theirs. She asked Abi to take a picture of the freezer exterior as a whole and to take a picture (or video) of the sensor and how/ where it is installed inside the freezer ?
- **Point of attention:** to approach the company carefully not to scare them as they seem relatively unprepared during the last meeting on LCA. Kate's suggestions: to send questions to them in advance, to split questions in smaller chunks. Monthly meeting are not a good idea. We need to find the best approach to get the information from them. It was agreed that Tamiris would visit Yumchop in the next weeks to collect data for LCA. Ideally, Tamiris' visit to Yumchop should take place when the students have been recruited for placements at Yumchop, as well as in a way that Tamiris can visit BED and HMF.
- **Next steps:** -Expansion of the pilot test with Yumchop – we can now propose to Yumchop that we are keen to instal sensors in Yumchop's vending machines and vans.
  - Meeting of REAMIT data analysis partners and Yumchop on the focus of data analysis for Yumchop – TBC by Sahar in the next couple of weeks.

**Blue Skies pilot:**

Company in Bedfordshire, UK producing fresh food, cut where produced and then sent to the UK.

- **Objective:** to monitor temperature in containers in which fresh food is stored during transit by plane from overseas locations in Brazil, South Africa, etc. to UK.
- **Progress:** -Beginning of January 2022 a meeting was organised with them. Blue Skies is interested to go ahead with the pilot test. They will send us some videos on how the company looks like, where the containers are at the airport in Heathrow and in Ghana (where the situation (temperature) of the food will be measured).  
-currently we are waiting for videos and images from Blue Skies of their containers at airports.  
- no update in February 2022 to report
- **Next step:** -Whysor to have a look at the video once received and decide the best sensors for the purpose and location for the sensors.  
-to establish the NDA requested by the company.

#### **Landgard (new pilot test in Germany):**

Landgard is a producer cooperative for flowers and plants, fruit and vegetables in Germany delivering fruit and vegetables from Germany and Europe on a daily basis. *Landgard experiences difference in quality of product (vegetables) between producers. Producer 1 and producer 2 both produce the same product. Producer 1 delivers a product with no quality issues. Producer 2 delivers a product with quality issues.*

- **Objective:** to investigate the cause of the quality difference in the same product between two different growers and thus reduce food waste with the product of producer 2.
- **Next steps:** Whysor was supposed to have a meeting with them at the end of January-beginning February 2022, but no contact from them has been received.  
-Imke will sent another e-mail to them on 22<sup>nd</sup> February 2022.  
-Imke suggested to use the sensors they already have and to install them inside the trucks and warehouse.

#### **BIOGROS pilot (Luxembourg):**

Supplier of high-quality organic food

- **Starting date:** November 2021.
- **Objective:** to gain insight on the climatic conditions (temperature and humidity) through the complete supply chain (trucks, warehouse, grower) for several fragile vegetables (mushrooms, onions, potatoes, celery root).
- **Progress:** -on 01/02/2022 Whysor had a meeting with BIOGROS  
-15 loggers and 15 RV/T sensors have been purchased and arrived at Whysor and will be assembled and calibrated over the next weeks. Nonetheless BIOGROS needs a total of 23 loggers and RV/T sensors. (to be discussed with Kate)

-Should expect some data coming in March 2022.

- **Next step:** -Whysor plans to send the loggers/sensors for self-installation and plan a visit May/June (good contacts with the company, a lot of progress).

**Action: Imke to send an e-mail to Kate about the additional 8 sensors needed.**

#### PILOT NETHERLANDS:

##### **Picnic pilot:**

- **Starting date:** November 2020
- **Progress:** -On 24 December 2021, a meeting was organised with Picnic to install the sensors.  
 -10 sensors have been installed but currently only 5 sensors are sending data. Tom is in contact with the company to figure it out.  
 -Imke is working on the NDA (but no answer from the company). \*important agreement to have in order to be able to collect more information from the company.  
 Kate raised concerns why only 5 sensors were sending data. Whysor did not know and would investigate it.
- **Next steps:** -to finalise the NDA  
 -to analyse the data collected  
 -to determine the cooling profile per coolbox.
- **COVID-19 related issues:** Infection rate is falling again, all locations have reopened under certain conditions since last week. It is recommended to work no more than half the time at the office. Events are permitted between 05.00-01.00 under certain conditions.

**Action: Sasha to contact Frank about the video project.**

**Action: Imke to contact Picnic to find out why only 5 sensors are sending data.**

##### **Van de Huijgevoort Groep pilot:**

Bread, salads and meat processing company for cold cuts and semi-finished products (chicken for salads, minced meat for sausage roll)

- **Objectives:** 1- to shorten the checks process on the presence of bacteria (listeria, salmonella) and avoid quality product loss (due to freezing and thawing) 2-to check the production room pressure
- **Progress:** -on 18/01/22 a meeting was organised with VDHG  
 -Progress has been made on pressure measurements, yet to discuss internally  
 -According to Mathias fresh detect sensors can not be used for the purposed intended to, but this might be used for hygiene measurements.
- **Next steps:** -to talk about other options to explore within the scope of the REAMIT project – good contact with the company which is very supportive. What to do with Fresh Detect?  
 -and then to decide which sensors to purchase



- **Expected starting date:** still to be determined

**Ongoing action:** James and Imke to discuss with Ram the possibility of using the FreshDetect sensors in another way as for instance to the best before date measurements.

#### **Glen Affric Brewery pilot (Sasha):**

A family owned Brewery, based in Liverpool, UK, producing canning and distributing beer around the country.

- **Starting date:** September 2021
- **Objective:** To minimise wastage during brewing and maintain the highest quality in beer produce, considering factors such as oxygen levels, gravity levels, temperature and yeast content. Ideally, GA would like to have a system to monitor and regulate the beer – where the sugar content, CO2 content, temperature control etc is all optimized. First issue to be solved: knowing when a beer is ready to be canned. To have better knowledge of what is happening on in the fermentation towers.+ the wasted barley is currently given away as food for animals but can be used more effectively.
- **Progress:** -On 6 January a meeting was held with JUMO, Whysor and NTU about the selection of sensors to be used for brewing process, their position as well as the purchasing. -Jumo, which is one of the leading manufacturers in the field of industrial sensor and automation technology, have offered a temperature sensor and a thermowell (they do not sell clamp-on flow sensors). -On mid-January Marco and Imke had a follow-up meeting with Job Joosten from JUMO regarding the quotation. -No answer received from them since beginning of January.
- **Next steps:**
  - Procurement and purchase of sensors- temperature, flow meter and thermowell by NTU (waiting for confirmation from Trevor and Lucio (GA)).
  - Installation of sensors
  - Begin data monitoring

**Ongoing action:** Sasha to purchase sensors for Glen Affric.

**Action:** Imke to send an e-mail to GA to ask if they need her help.

#### **PILOT FRANCE (Omar Dib):**

*\*Omar Dib is working with Ali Assaf on the REAMIT project (still waiting for official agreement).*

**Routhiau pilot:**

- **Progress:** Automation of the analysis, and development of algorithm for the selection of “interesting areas” (motorised stage for automatic analysis): -integration of Rama system in cold room (real condition).
- **Next steps:** -to complete the automation of the analysis (February 2022)  
-to define the algorithm for the selection of “interesting areas” (February 2022).  
-to start the integration/test in real conditions with Routhiau (May-June 2022).  
-to find new pilots (with the help of I&R and Valorial).

## WP T1 meeting, 21/03/2022

### 11 Participants:

Name	Institution
Katarzyna Pelc	BED
Sahar Ahmadzadeh	BED
James Gillespie	UU
Gautam Samriya	ITTRALEE / MTU
Sasha Bennett	NTU
Xavier Cama	UCD
Gaël Maugis	I&R
Gladys Gallot	I&R

### Absent:

**Imke Hermens, Whysor**

**Usha Ramanathan, NTU**

**Ali Assaf, UoN**

**Omar Dib, UoN**

**Tamiris da Costa, UCD**

General information:

All the presentations with update from pilots to be uploaded under the Sharepoint:

**REAMIT Documents > WP T1 Meeting > Slides Meeting 21 March 2022**

## **GENERAL INFORMATION:**

Request from Kate:

### **Action: @All pilot leads**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot lead sends this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.

If a Pilot lead is not able to attend this compulsory meeting, this information should be send (to Kate and me) ahead of the meeting.

## **UK PILOT TESTS (Kate):**

### **Yumchop pilot:**

UK based company selling frozen food ready to eat (warm food in microwave)

- **Starting date:** 21 December 2020
- **Objectives:** **1-**To ensure that frozen food is stored in the right temperature in the Yumchop food factory. **2-**To ensure that frozen food is transported in the right temperature from Yumchop food factory to where vending machines are located (e.g. NHS hospitals) or to private homes (Yumchop home delivery service). **3-**To provide food fingerprint (i.e. data on the condition in which food produced by Yumchop has been stored and transported).
- **Progress:** - In March 2022 a case study on Yumchop was shared with Abi and Michael Adefisan: 'Some experiences on the use of digital technologies to reduce food waste and improve operational efficiency of a frozen food company – The case of Yumchop Foods in the UK'. Purpose of this case study: to be used for university students, however the ambition is to develop research publications in the future.  
 -In March 2022 a poster on Yumchop was developed by NTU with inputs from partners and shared with Abi and Michael Adefisan

- **Point of attention:** to approach the company carefully not to scare them as they seem relatively unprepared during the last meeting on LCA.
- **Next steps:** -to schedule a meeting of REAMIT data analysis partners and Yumchop on the focus of data analysis for Yumchop – date TBC based on input (awaited) from Yumchop.  
 -to schedule a visit of Tamiris at Yumchop in March/April 2022 for LCA (TBC).

#### **Human Milk Foundation pilot:**

Human Milk Foundation (HMF), founded in 2017 in UK, is a charity working to help more families feed their babies with human milk.

- **Starting date:** July 2021
- **Objective:** to monitor temperature in which human milk is transported between a donor – Human Milk Bank – Hospital/home; and send alerts if these conditions change.  
**Progress:** -all equipment (12 loggers, 12 temperature and humidity sensors, 12 binary sensors) arrived at BED.  
 -Sahar is currently wiring sensors (with online support from JG)- the work will continue next Wednesday and will be completed hopefully by the end of this week.  
 -Mike Grimwade-Mann (from HMF) has sent an email to BED and Whysor to share Google Form (collecting data on trips of human milk).  
 -last week, Kate met online with Imke to review Whysor dashboard for HMF. Data are coming, 4 trips in total per month. Imke will send weekly report to HMF.  
 -Based on Kate, Sahar and Tahmina's experience with testing the Blue Maestro sensor and Levstone's App, a decision was made at BED that in order to progress with the Blue Maestro sensors and Levstone App for HMF, Levstone would need to develop a Manual for the Blue Maestro sensor and system, as well as simplify the APP, as currently the system and the App are too complex to be used by HMF. The system would need to be simplified for the HMF. This has been communicated to Levstone. No other updates on Blue Maestro sensor and system proposed by Levstone have been obtained from Levstone.  
 -Tahmina and Sahar are keen to do experiments with the Blue Maestro sensor from Levstone.
- **Next steps:** -to arrange a visit at HMF- an email was sent to HMF (Mike Grimwade-Mann and Natalie Shenker) to propose some dates. Objectives are to: install sensors, collect more input for LCA, take photos and footage inside HMF, have a tour of HMF. Proposed participants: Sahar, James, Tamris, Sasha, Ram and Kate.
- **Point of attention:** Request to include Kate in future email communication with HMF.  
 +Request to be very careful when communicating with HMF

**Action: Kate to talk about the next steps with Levstone with Ram on Tuesday, 22 March.**

**Action: Gautam to have a look at the google form given by HMF.**

#### **Blue Skies pilot (Sahar):**

Company in Bedfordshire, UK producing fresh food, cut where produced and then sent to the UK.

- **Objective:** to monitor temperature in containers in which fresh food is stored during transit by plane from overseas locations in Brazil, South Africa, etc. to UK.
- **Progress:** -Beginning of January 2022 a meeting was organised with them. Blue Skies is interested to go ahead with the pilot test. They will send us some videos on how the company looks like, where the containers are at the airport in Heathrow and in Ghana (where the situation (temperature) of the food will be measured).  
-currently we are waiting for videos and images from Blue Skies of their containers at airports.  
->no update in March 2022 to report
- **Next step:** -Sahar will send a reminder about the materials they have to provide.  
-Whysor to have a look at the video once received and decide the best sensors for the purpose and location for the sensors.

#### ULSTER PILOT TESTS (James):

##### **WD Meats – Dry ageing trial:**

- **Starting date:** 6th July 2021
- **Objective:** To reduce weight and quality lost from beef meat during the dry-aging process by installing temperature and humidity sensors to map readings across chambers.
- **Progress:** -on 10th March 2022, James visited WD Meats to launch the second iteration of the pilot. The things network architecture that we were using as an interface between the sensors and Whysor cloud had been deprecated. Marco had spent a week upgrading all gateways that are maintained by Whysor in late '21, but this gateway was officially commissioned by Ulster so he did not have access to it  
-James took the gateway home and reconfigured it with the new endpoints for the things stack  
-The sensors needed re-paired to the gateway since it was running a fresh install ->3 sensors re-paired; one sensor was not accessible with the micro-usb programming cable due to sustained damage from the first trial  
**Next steps:** -to provide the new web hook to Marco so that the gateway can be reintegrated to the Whysor service (and thus the shared instance) - waiting on confirmation what details he needs me to provide  
-to think about ordering new temp/RH LoRaWAN sensors since the Ursalink have been discontinued, only have three left. We will need to select sensors for the burns meats trial anyway. The Dragino seems suitable - checking compatibility  
-to check with Marc if he is happy to run the next trial with three sensors in the interim. James should be able to visit this week on Thursday or Friday if so.
- **Issues:** -to discover the ideal parameters for the dry ageing process which minimize dark facings while avoids harmful bacteria formulation. There is a statistically significant difference between the front and rear HQ weights due to the refrigeration unit located at the front of the lorry - fluid dynamics?

##### **WD Meats – Clostridium Estertheticum trial:**

- **Objectives:** To strengthen the method of detection allowing for immediate clean-up of surfaces when detected and reduced beef waste in abattoirs, retailers and homes.
- **Progress:** -on 10th March 2022: Clostridium mastermix kit has been ordered and delivered to James Dooley at his lab.  
 -Clostridium bacteria source at UCD was dead. James Dooley has ordered Clostridium DNA from DSMZ  
 -WD Meats have purchased a Genesys PCR machine to perform their own swabbing / testing at the factory. Currently they are facing some false negative readings - James Dooley suggested a potential collaboration between UU and WD Meats to help them calibrate the machine. Results from UU testing should feed directly into this Genesys venture.  
 PCR approach will still take upwards of 24h for results, even testing in house.
- **Next steps:** -Need to source clostridium bacteria  
 -Once we have the CB, the minimum level of detection will be calculated, and Ulster will need to have a meeting with Sensipdx: to check if their equipment is suitable and if so are they still willing to collaborate/how can we incentivise them? (They were originally approached for the capitalisation call). -to wait the results before contacting them.
- **Expected starting date for a pilot test:** not known

**Ongoing action: James to schedule a meeting with Sensipdx.**

### **3DF trial:**

- **Objective:** Use 3DF technology to reduce food waste. 3DF sensors can be used to make determinations of total bacterial count on products or liquids.
- **Progress:** One Fresh Detect sensor has been lent to UCD, which has now been lent to Imke, One Fresh Detect has been lent to Tahmina at BED.  
 -On 17 December 2021, meeting organised with Matthias to discuss the use of FreshDetect for VDH project (for Salmonella, Listeria, etc.)- agreed after consultation that this is outside of the scope of the REAMIT project.
- **Next steps:** -to decide if these activities should be pursued considering Freshdetect is not 3D.  
 -to talk to other companies to find appropriate device for 3DF technologies.
- **Expected starting date for the pilot test:** not known.
- **Continuation/other trial opportunity:**  
 -Discussion initiated with Xavier (UCD) to more fully understand the FreshDetect/ Spectroscopy technology and discussed potential use cases within the REAMIT project  
 -Potential use in the checking of poultry products being delivered to Musgrave Cash and Carry. ->Matthias confirmed that some testing had been trialed through cellophane, however the cellophane would need to be pressed right against the poultry fillet in order to achieve an accurate reading +the freshdetect needs to be used on a flat surface of the poultry for it to produce accurate readings  
 -Jipsy has already tried a similar trial with FreshDetect on packaged chicken with unconvincing results  
 -James spoke to Matthias about reusing the FreshDetect on commercial kitchen surfaces, such as these at VHG (Dutch company recruited by Whysor). He said that the reflective properties of steel countertops could cause

issue. Some exploratory work carried out on a conveyer belt setup in Denmark. University of Bonn was also researching similar.

- Ram thinks that FreshDetect sensor may not be suitable (helpful) for the WD Meats and VHG pilot tests and suggested that Ulster look for a different solution.
- Ulster is planning to recruit in the months to come another researcher specializing in 3DF sensors or spectroscopy.
- if 3DF is up and running, Trevor has a contact with a company and James has been in touch with a lab at Belfast University working on fish.

### **Musgrave trial:**

- **Objective:** to install temperature and humidity sensors and have an alerting system /cloud upload from Musgrave phone which can warn if food is at risk of spoilage.
- **Progress:** -4 further Eagle loggers have been ordered from South Africa and arrived at Whysor + James ordered 4 temp/humidity probes from Farnell to wire into these loggers when they will arrive in Belfast. ->The 4 sensors arrived on 4<sup>th</sup> February 2022, and 4 loggers arrived on 9<sup>th</sup> February 2022.  
 -James visited the facility on Monday, 28th: visit of the vans and planning of the installation/location of the sensors
- **Next steps:** -to envisage monitoring the different zones of the vans per logger (each van has both a chill and a freeze zone) following Keith- Logistics Manager, remark. ->technically it seems possible according to James.  
 -to continue the work ongoing with Marco on adding a second temperature probe; this has involved adding a new sensor which hasn't been trialed by Whysor before (due to limitations of the communication buses)  
 -James to add the 5 new sensor probes to the loggers and continue the work on the integration at present  
 -Digital Matter have provided a 'working configuration' for the one wire Maxim Integrated DS18B20 to Marco. He also has a sensor. He is working on the solution this week  
 -UU team have suggested James install the loggers with one sensor if a working solution is not provided shortly. James can add the second sensor if Marco gets it working at a later stage
- **Expected starting date:** ?

### **IRISH PILOT TESTS (Xavier):**

### **Burns Farm Meats (new pilot):**



Burns Farm Meats is an abattoir and farm producer located near the town of Sligo, in the north-west of Ireland. Their operations include: operation of an abattoir, wholesale of beef, lamb and pork to the catering and hospitality sector, delivery of retail orders to the public, processing of organic beef, lamb and pork.

- **Objective:** to monitor temperature and humidity in the cold storage rooms to reduce food waste ( a loss of meat occurs during the maturing process, especially regarding the parts of meat with more exposure to the environment) and establish and implement an alerting system that can warn if certain areas do not have the appropriate conditions.
- **Starting date:** to be confirmed.
- **Partners involved:** Whysor – technical support, technology configuration, dashboard/data transfer; BEDS – cloud storage ; Ulster – technical support
- **Equipment, sensors used and deployed:** LoRa gateway (to be confirmed) and Temp. and humidity sensors (to be confirmed) –to use their Wifi ?!
- **Progress:** -2 virtual meetings have been conducted with the company.  
They know they have a loss and they are very interested in temperature sensors as they use the cold units for different purposes, i.e., not necessarily keeping one particular set of meat at a time until the maturation process is concluded, and they suspect the door may be open for too long.
- **Next steps:** -on 23<sup>rd</sup> of March 2022: a visit of the site has been scheduled by Xavier with James and Gautam (he will travel tomorrow) to have a look at their facilities and help select sensors.

#### **Glen Affric Brewery pilot (Sasha):**

A family owned Brewery, based in Liverpool, UK, producing canning and distributing beer around the country.

- **Starting date:** September 2021
- **Objective:** To minimise wastage during brewing and maintain the highest quality in beer produce, considering factors such as oxygen levels, gravity levels, temperature and yeast content. Ideally, GA would like to have a system to monitor and regulate the beer – where the sugar content, CO2 content, temperature control etc is all optimized. First issue to be solved: knowing when a beer is ready to be canned. To have better knowledge of what is happening on in the fermentation towers.+ the wasted barley is currently given away as food for animals but can be used more effectively.
- **Progress:** -On 6 January a meeting was held with JUMO, Whysor and NTU about the selection of sensors to be used for brewing process, their position as well as the purchasing.  
-Jumo, which is one of the leading manufacturers in the field of industrial sensor and automation technology, have offered a temperature sensor and a thermowell (they do not sell clamp-on flow sensors).  
-On mid-January Marco and Imke had a follow-up meeting with Job Joosten from JUMO regarding the quotation.  
-No answer received from them since beginning of January.  
-Despite multiple emails from Usha, Sasha as well as Imke, no update has been received from them.

- **Next steps:**

- Procurement and purchase of sensors- temperature, flow meter and thermowell by NTU (waiting for confirmation from Trevor and Lucio (GA)).
- Installation of sensors -Begin data monitoring

**Ongoing action:** Sasha to purchase sensors for Glen Affric.

**Action:** Sasha to try again to contact them, more particularly Dan replacement to see if the company is willing to engage

**Action:** Kate to talk about this issue with Ram on her meeting 22 March.

**Action:** Gautam to send some information about the exhibition attended.

**Landgard (new pilot test in Germany):**

Landgard is a producer cooperative for flowers and plants, fruit and vegetables in Germany delivering fruit and vegetables from Germany and Europe on a daily basis. *Landgard experiences difference in quality of product (vegetables) between producers. Producer 1 and producer 2 both produce the same product. Producer 1 delivers a product with no quality issues. Producer 2 delivers a product with quality issues.*

- **Objective:** to investigate the cause of the quality difference in the same product between two different growers and thus reduce food waste with the product of producer 2.
- **Next steps:** Whysor was supposed to have a meeting with them at the end of January-beginning February 2022, but no contact from them has been received.  
-Landgard finally replied and wants to meet in April 2022.

**BIOGROS pilot (Luxembourg):**

Supplier of high-quality organic food

- **Starting date:** November 2021.
- **Objective:** to gain insight on the climatic conditions (temperature and humidity) through the complete supply chain (trucks, warehouse, grower) for several fragile vegetables (mushrooms, onions, potatoes, celery root).
- **Progress:** -on 9/03/2022, loggers/sensors were sent to BIOGROS and arrived there.BIOGROS will self-install the sensors in 15 different locations in the next week.

-on 11/03/2022, a meeting took place with BIOGROS where was discussed: alerts for trucks with trip detection, thresholds of temperature and humidity will be provided to us

**Next step:** -to ask the consortium: what the threshold for RH is in a warehouse for e.g. packaged dairy products, fruit, and vegetables.

-to discuss with Sasha photographs and video material

-a list with placing and naming of all the sensors will be provided

-6 more loggers/ sensors are needed

#### PILOT NETHERLANDS:

##### **Picnic pilot:**

- **Starting date:** November 2020
- **Progress:** -10 sensors have been installed but currently only 5 sensors are sending data. Tom is in contact with the company to figure it out.  
-Imke is working on the NDA (but no answer from the company).
- **Next steps:** -on 31/03/2022, a meeting is planned with Picnic to talk about: NDA, finding out why some sensors aren't working, installing 10 new sensors, data required from Picnic.

**Ongoing action: Imke to contact Picnic to find out why only 5 sensors are sending data.**

##### **Van de Huijgevoort Groep pilot:**

Bread, salads and meat processing company for cold cuts and semi-finished products (chicken for salads, minced meat for sausage roll)

- **Objectives:** 1- to shorten the checks process on the presence of bacteria (listeria, salmonella) and avoid quality product loss (due to freezing and thawing) 2-to check the production room pressure
- **Progress:** -on 18/01/22 a meeting was organised with VDHG  
-Progress has been made on pressure measurements, yet to discuss internally and see what sensors are best for this project.  
-According to Mathias fresh detect sensors cannot be used for the purposed intended to, but this might be used for hygiene measurements.
- **Next steps:** -to talk about other options to explore within the scope of the REAMIT project – good contact with the company which is very supportive. What to do with Fresh Detect?  
-and then to decide which sensors to purchase
- **Expected starting date:** still to be determined

**Ongoing action: James and Imke to discuss with Ram the possibility of using the FreshDetect sensors in another way as for instance to the best before date measurements.**

**PILOT FRANCE (Omar Dib):**

***Routhiau pilot:***

- **Progress:** work is ongoing on the stage 2 “the transition between lab and company”, before test in real conditions expected to start in June 2022. The positioning of the probe has been reconfigured and the focal distance “Z” has been determined. The system is currently functioning.
- **Next steps:** -the initiation of the process will start on 23/03/2022- quality monitoring over 30 days start (end date: 22/04/2022).

## WP T1 meeting, 25/04/2022

### 11 Participants:

Name	Institution
Katarzyna Pelc	BED
Imke Hermens	Whysor
James Gillespie	UU
Gautam Samriya	ITTRALEE / MTU
Sasha Bennett	NTU
Xavier Cama	UCD
Omar Dib	UoN
Tamiris da Costa	UCD
Gaël Maugis	I&R
Gladys Gallot	I&R

### Absent:

Usha Ramanathan, NTU  
 Sahar Ahmadzadeh, BED

General information:

All the presentations with update from pilots to be uploaded under the Sharepoint:

**REAMIT Documents > WP T1 Meeting > Slides Meeting 25 April 2022**

## **GENERAL INFORMATION:**

Request from Kate:

### **Action: @All pilot leads**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot lead sends this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.

If a Pilot lead is not able to attend this compulsory meeting, this information should be send (to Kate and me) ahead of the meeting.

**Recording:** [https://imagesetreseaux-my.sharepoint.com/:v:/g/personal/ggallot\\_images-et-reseaux\\_com/EUvKYW7hkdkEi9RUwcai8eMBS\\_T5zMauO2HSHSE1Sk42A](https://imagesetreseaux-my.sharepoint.com/:v:/g/personal/ggallot_images-et-reseaux_com/EUvKYW7hkdkEi9RUwcai8eMBS_T5zMauO2HSHSE1Sk42A)

**Action: Kate to discuss and check with Ram what is actually requested for the deliverables 3.1; 3.2; 3.3 and see if the submission should be postponed (in December?!).**

**Action: Gladys to send to each pilot lead the template to fill in for describing the pilots under deployment.**

**Other information:** Imke announced that she will start another job in May 2022. She will work 20 hours/ week for a company and only 8 hours for Whysor until September 2022. Until then Marco will do some of her work.

## **UK PILOT TESTS (Kate):**

### **Human Milk Foundation pilot:**

Human Milk Foundation (HMF), founded in 2017 in UK, is a charity working to help more families feed their babies with human milk.

- **Starting date:** July 2021
- **Objective:** to monitor temperature in which human milk is transported between a donor – Human Milk Bank – Hospital/home; and send alerts if these conditions change.
- **Progress:** on 30/03/2022 James Gillespie from Ulster visited BED and wired 10 loggers, 10 temperature and humidity sensors and 10 binary sensors.
  - BED purchased 40 batteries (4 per logger) and Velcro for the 10 sets. All new loggers are visible in Whysor Dashboard.
  - loggers were initially reporting data every 5 minutes. James got Marco to push the trip configuration to preserve battery life (hence the readings stopping at 11:45 on the charts). The loggers will now take measurements every hour and upload to the cloud every 12 hours when there is no motion detected, but will log and upload every 5 minutes when motion is detected (aka when the bag is in a trip) to allow for real time monitoring and alerting.
  - on 25/03/2022 and on 4/04/2022 BED sent emails to Natalie Shenker at HMF to arrange a visit at HMF to install sensors, take footage and photos of sensor installation, collect information for LCA and have a tour of HMF
  - on 16/04/2022, James spoke to Mike, he seems to ignore the part about installation of sensors.
- **Next steps:** -to arrange a reduced visit at HMF ASAP mainly to install sensors. Proposed participants: James, Sahar, Kate, Ram
- **Point of attention:** Request to include Kate in future email communication with HMF. +Request to be very careful when communicating with HMF

**Action:** Kate to ask HMF which type of alert they want, when they want to receive it and who should receive it.

**Action:** BED to send an email to Nathalie regarding installation of sensors at HMF.

**Yumchop pilot:**

UK based company selling frozen food ready to eat (warm food in microwave)

- **Starting date:** 21 December 2020
- **Objectives:** 1-To ensure that frozen food is stored in the right temperature in the Yumchop food factory. 2-To ensure that frozen food is transported in the right temperature from Yumchop food factory to where vending machines are located (e.g. NHS hospitals) or to private homes (Yumchop home delivery service). 3-To provide food fingerprint (i.e. data on the condition in which food produced by Yumchop has been stored and transported).
- **Progress:** - In March 2022 a case study on Yumchop was shared with Abi and Michael Adefisan: 'Some experiences on the use of digital technologies to reduce food waste and improve operational efficiency of a frozen food company – The case of Yumchop Foods in the UK'. -In March 2022 a poster on Yumchop was developed by NTU

-In April 2022, before Easter, Imke had several exchanges by e-mails with Abi, mainly about one sensor which is sending too much alerts (maybe wrongly installed). Whysor asked Abi to send pictures but they are still waiting for her answer.

Imke suggests that someone have an online call with Marco from Whysor before they visit Yumchop. Marco will instruct how to check installation of sensors when a visit at Yumchop takes place. Maybe the door of the freezer is open or sensor is installed next to the door instead of at the back of the freezer. This will need to be checked at corrected on site at Yumchop's factory by the team visiting Yumchop.

- **Point of attention:** to approach the company carefully not to scare them as they seemed relatively unprepared for the volume of information required by REAMIT during the last meeting on LCA in Dec-2021.
- **Next steps:** -to schedule a visit of Tamiris at Yumchop in March/April 2022 for LCA (TBC).

**Action: Kate to organise a video call with Marco from Whysor before a visit at Yumchop to get instructions from Marco how to check the installation of the sensors. Organise another video call with Marco while REAMIT team is visiting Yumchop on the site.**

**Blue Skies pilot:**

Company in Bedfordshire, UK producing fresh food, cut where produced and then sent to the UK.

- **Objective:** to monitor temperature in containers in which fresh food is stored during transit by plane from overseas locations in Brazil, South Africa, etc. to UK.
- **Progress:** -Beginning of January 2022 a meeting was organised with them. Blue Skies is interested to go ahead with the pilot test.  
 -5 videos have been sent and uploaded to the Sharepoint (showing how the flow is loaded, what happen at arrival of the containers, etc.). ->according to Whysor this pilot test will be challenging mainly due to connectivity issues Whysor explained that we are facing connectivity issues in some places in the UK (HMF) where internet coverage is very good. We may expect more challenges with connectivity issues in places like Ghana, where we do not know quality of connectivity.
- **Next step:** -After viewing the videos from Blue Skies, Whysor is going to ask one of their suppliers if they have a solution (logger) for this/ something that exists already. The solution that Whysor currently have, could be the best they can offer, but may not be good enough for this pilot test.  
 -Whysor also identified several challenges like the connectivity of the loggers during the whole trip (are we allowed to send measurements when a plane is in the air?! And if this is only possible when the plane is on the ground, what about the connectivity in Ghana/ Africa?!). They also noticed that there is a lot of aluminium foil in the containers which could block signals. Kate asked Imke for more input about this pilot test as we need to inform Blue Skies whether we can go ahead with this work or not, as it maybe above REAMIT capabilities. Imke said that it maybe that Blue Skies are using the best solution possible and existing in the market to protect their produce. Maybe a better solution does not exist yet in the market for Blue Skies.



**Action: Imke to send some information to Kate to decide what the follow up actions of this pilot test should be.**

#### PILOT NETHERLANDS:

##### **Van de Huijgevoort Groep pilot:**

Bread, salads and meat processing company for cold cuts and semi-finished products (chicken for salads, minced meat for sausage roll)

- **Objectives:** **1-** to shorten the checks process on the presence of bacteria (listeria, salmonella) and avoid quality product loss (due to freezing and thawing) **2-**to check the production room pressure
- **Progress:** In March/April 2022, Whysor purchased -2 electronic sub-pressure sensors ) (<https://www.dol-sensors.com/products/dol-18-sub-pressure-sensor/>) which are currently tested by Whysor.  
 ->The idea is to install one sensor inside the production room and the other outside, to compare the pressure and make sure the pressure inside is higher than the pressure outside. Van de Huijgevoort would like to have an alert when the system is out of function because when pressure inside is too low insects get inside and infect food, leading to food waste.
- **Next steps:** -in June 2022: to install the sensors inside the facilities of the group.
- **Expected starting date:** still to be determined

##### **Landgard (in Germany):**

Landgard is a producer cooperative for flowers and plants, fruit and vegetables in Germany delivering fruit and vegetables from Germany and Europe on a daily basis. *Landgard experiences difference in quality of product (vegetables) between producers. Producer 1 and producer 2 both produce the same product. Producer 1 delivers a product with no quality issues. Producer 2 delivers a product with quality issues.*

- **Objective:** to investigate the cause of the quality difference in the same product between two different growers and thus reduce food waste with the product of producer 2.
- **Progress:** Landgard finally reported back to Whysor and wants to meet in April 2022
- **Next steps:** -on 29/04/2022: a meeting between Whysor (Marcel) and Landgard is scheduled. Marcel will bring the sensors equipment (previously planned for the other German company Weyers ), he will meet with a technician also.
- **Point of attention:** this pilot will have to run fast if we only have until June for the deployment of pilot tests.

**BIOGROS pilot (Luxembourg):**

Supplier of high-quality organic food

- **Starting date:** November 2021.
- **Objective:** to gain insight on the climatic conditions (temperature and humidity) through the complete supply chain (trucks, warehouse, grower) for several fragile vegetables (mushrooms, onions, potatoes, celery root).
- **Progress:** -the 15 sensors sent to them have been installed in different places (trucks, warehouse)  
-Data is coming in.
- **Next step:** -to ask the consortium: what the threshold for RH is in a warehouse for e.g. packaged dairy products, fruit, and vegetables.->Imke will get back to this next week.  
-BED will purchase 6 extra sensors (mainly to be installed at producers)  
-Imke will create a dashboard with all the sensors already installed. She will also rename the sensors according to the location they were installed in.  
-to collect data and send it to the BED cloud  
-on 05/07/2022: the REAMIT team is invited to visit Biogros (just before the RAC meeting)

**Action: Sasha to send an email to Imke about the poster she is working on for this pilot test.**

**Picnic pilot:**

- **Starting date:** November 2020
- **Progress:** on 31/03/2022: a meeting took place with Picnic. The main feeling is that they are not happy with us. They expected something already ready for the market. (Kate suspects they may be disappointed and may not be willing to invest resource in this -10 new sensors have been installed, 7 are not working but Whysor do not know why. Whysor need to understand why they broke down to make something more sustainable (maybe housing is not strong enough). Whysor is not able to find out in which box the sensors are located as the boxes were not labelled and there are hundreds of boxes in Picnic's factory.  
-There is an issue with the NDA: Picnic is a data driven company but they are not keen on sharing their data. Imke has been working on this document for several months and she sent the work done within the REAMIT team but there is still no agreement on this from Picnic.  
-on 04/04/2022, Imke sent the minutes from this meeting to them and she also sent a reminder today, without any response yet.
- **Next steps:** -to install new sensors (but after knowing what was the problem with the others sensors).
- **Point of attention:** Imke said that the communication with the companies has to be very clear, especially regarding the expectations. The companies involved in the pilot test are testing something new, not ready for the market yet. they need to be aware of it to manage their expectations.

**Glen Affric Brewery pilot (Sasha):**

A family owned Brewery, based in Liverpool, UK, producing canning and distributing beer around the country.

- **Starting date:** September 2021
- **Objective:** To minimise wastage during brewing and maintain the highest quality in beer produce, considering factors such as oxygen levels, gravity levels, temperature and yeast content. Ideally, GA would like to have a system to monitor and regulate the beer – where the sugar content, CO2 content, temperature control etc is all optimized. First issue to be solved: knowing when a beer is ready to be canned. To have better knowledge of what is happening on in the fermentation towers.+ the wasted barley is currently given away as food for animals but can be used more effectively.
- **Progress:** -On 6 January 2022 a meeting was held with JUMO, Whysor and NTU about the selection of sensors to be used for brewing process.  
 -Jumo have offered a temperature sensor and a thermowell.  
 -On mid-January 2022 Marco and Imke had a follow-up meeting with Job Joosten from JUMO regarding the quotation.  
 -No answer received from them since beginning of January 2022.  
 -Despite multiple emails from Usha, Sasha as well as Imke, no update has been received from them (head office, owner, and his son )
- **Next steps:**  
 -to try to find a solution to get in contact with someone from the company still working there.  
 -Procurement and purchase of sensors- temperature, flow meter and thermowell by NTU (waiting for confirmation from Trevor and Lucio (GA))???
- Installation of sensors -Begin data monitoring???

**Action: Sasha to speak to Ram about the current situation with this pilot and about the possibility for NTU to start looking for another pilot test company in UK through NTU's channels.**

**Action: Imke to send to Sasha, Anthony's e-mail address**

#### ULSTER PILOT TESTS (James):

#### **WD Meats – Dry ageing trial:**

- **Starting date:** 6 July 2021
- **Objective:** To reduce weight and quality lost from beef meat during the dry-aging process by installing temperature and humidity sensors to map readings across chambers.
- **Progress:** on 10 March 2022, James visited WD Meats to launch the second iteration of the pilot. The things network architecture that we were using as an interface between the sensors and Whysor cloud had been

deprecated. Marco had spent a week upgrading all gateways that are maintained by Whysor in late '21, but this gateway was officially commissioned by Ulster so he did not have access to it

- James took the gateway home and reconfigured it with the new endpoints for the things stack
- the sensors needed re-paired to the gateway since it was running a fresh install ->after some work all 4 sensors re-paired
- Tom provided the Webhook details to connect the gateway back to the Whysor cloud.
- on 30/03/2022, the 4 sensors have been installed at WD meats on a trailer which had been loaded the day before
- on 25/04/2022: Marc called James to say that the meat was unloaded on 20th April and sensors taken off. He is to calculate the weight loss of each HQ and will send it through to James.

**Next steps:** -WD Meats to provide the measurements of quality/loss at end of dry-aging cycle.

They are treating this iteration as the control using the 2/2 sensor configuration over the full 21 day ageing period. They then are going to want to change some of the variables to see how the weight loss is affected.

-Marc to suggest different structuring of carcass's / or temperature / humidity control settings after findings from trial before running experiment again to see effects?

- **Issues:** to discover the ideal parameters for the dry ageing process which minimize dark facings while avoids harmful bacteria formulation. There is a statistically significant difference between the front and rear HQ weights due to the refrigeration unit located at the front of the lorry - fluid dynamics?

### **WD Meats – Clostridium Estertheticum trial:**

- **Objectives:** To strengthen the method of detection allowing for immediate clean-up of surfaces when detected and reduced beef waste in abattoirs, retailers and homes.
- **Progress:** on 10 March 2022: Clostridium mastermix kit has been ordered and delivered to James Dooley at his lab.
  - Clostridium bacteria source at UCD was dead. James Dooley has ordered Clostridium DNA from DSMZ -> he was still waiting for it to arrive on 13th April before Easter. James is following up.
  - WD Meats have purchased a Genesys PCR machine to perform their own swabbing / testing at the factory. Currently they are facing some false negative readings - James Dooley suggested a potential collaboration between UU and WD Meats to help them calibrate the machine.
  - >Marc emailed James to say he would be very keen for this collaboration / training to happen. James Dooley has confirmed he has a Masters student in place for the work and he will be happy to collaborate (he is currently busy but he will be more flexible for these research tasks in the coming months).
  - Results from UU testing should feed directly into this Genesys venture.
  - PCR approach will still take upwards of 24h for results, even testing in house.
- **Next steps:** -Need to source clostridium bacteria
  - Once we have the CB, the minimum level of detection will be calculated, and Ulster will need to have a meeting with Sensipdx: to check if their equipment is suitable and if so are they still willing

to collaborate/how can we incentivise them? (They were originally approached for the capitalisation call). -to wait the results before contacting them.

- **Expected starting date for a pilot test:** not known

**Ongoing action: James to schedule a meeting with Sensipdx.**

**3DF trial:**

- **Objective:** Use 3DF technology to reduce food waste. 3DF sensors can be used to make determinations of total bacterial count on products or liquids.
- **Progress:** One Fresh Detect sensor has been lent to UCD, which has now been lent to Imke, One Fresh Detect has been lent to Tahmina at BED.  
 -On 17 December 2021, meeting organised with Matthias to discuss the use of FreshDetect for VDH project (for Salmonella, Listeria, etc.)- agreed after consultation that this is outside of the scope of the REAMIT project.
- **Next steps:** -to decide if these activities should be pursued considering Freshdetect is not 3D.  
 -to talk to other companies to find appropriate device for 3DF technologies.
- **Expected starting date for the pilot test:** not known.
- **Continuation/other trial opportunity:**  
 -Discussion initiated with Xavier (UCD) to more fully understand the FreshDetect/ Spectroscopy technology and discussed potential use cases within the REAMIT project  
 -Potential use in the checking of poultry products being delivered to Musgrave Cash and Carry. ->Matthias confirmed that some testing had been trialed through cellophane, however the cellophane would need to be pressed right against the poultry fillet in order to achieve an accurate reading +the freshdetect needs to be used on a flat surface of the poultry for it to produce accurate readings  
 -Jipsy has already tried a similar trial with FreshDetect on packaged chicken with unconvincing results  
 -James spoke to Matthias about reusing the FreshDetect on commercial kitchen surfaces, such as these at VHG (Dutch company recruited by Whysor). He said that the reflective properties of steel countertops could cause issue. Some exploratory work carried out on a conveyer belt setup in Denmark. University of Bonn was also researching similar.  
 - Ram thinks that FreshDetect sensor may not be suitable (helpful) for the WD Meats and VHG pilot tests and suggested that Ulster look for a different solution.  
 - Ulster is planning to recruit in the months to come another researcher specializing in 3DF sensors or spectroscopy (some budget will be available in June)  
 -if 3DF is up and running, Trevor has a contact with a company and James has been in touch with a lab at Belfast University working on fish.

**Musgrave trial:**

- **Objective:** to install temperature and humidity sensors and have an alerting system /cloud upload from Musgrave phone which can warn if food is at risk of spoilage.
- **Progress:** -On 28/03/2022, James visited the facility

-Marco (Whysor) has completed work on trip detection algorithm, using accelerometer data logged by the Eagle device to trigger when the trip has commenced and ended. This algorithm will also be used to improve the battery life of the logger, using 'sleep/wake' information. When no trip is detected, recordings are made every hour and uploaded to the cloud every 12 hours. When accelerometer detects a trip data is recorded and uploaded every 5 minutes.

-Keith, Logistics Manager, explained that each van has both a chill and a freeze zone. He asked if it is possible to monitor both of these zones per logger. James has worked with Marco on adding a second temperature probe; this has involved adding a new sensor which hasn't been trialled by Whysor before (due to limitations of the communication buses).

-James ordered 5 DS18B20 temperature probes. Digital Matter provided a 'working configuration' for the one wire Maxim Integrated DS18B20 to Marco.

->Because they were on 3m cable runs to facilitate temperature monitoring in the rear of the van, they needed a 5v supply. The eagle logger only provided a 3.3v regulated supply.

-Marco and James decided the easiest solution would be to add a 5v step up regulator to each of the DS18B20 sensors. This regulator takes the 3.3v supply and 'boosts' it to 5v. O

=>**On 23/04/2022: James installed the dual-zone monitoring sensors in 3 delivery vans at Musgrave** (videos has been recorded for the REAMIT documentary by Richard)

- **Next steps:** -In the coming weeks: the loggers will be installed in the 2 remaining vans (on another Saturday)
  - James will monitor the initial data and help Musgrave decide how long the delay should be before reporting an alert (rule logic for text alerts still needs refined)
  - Dashboard accounts need set up for 3 logistics staff members at Musgrave to allow them to monitor the vans
  - Trevor to visit Rich in Derry to shoot his piece for the documentary - he'll talk about supply chain / cold-chain logistics and link it to the pilot work.
  - Robert from Musgrave will perform interview for Rich - to be arranged. Robert was not available on Saturday

- **Expected starting date: ?**

### IRISH PILOT TESTS (Xavier):

#### **Burns Farm Meats (new pilot):**

Burns Farm Meats is an abattoir and farm producer located near the town of Sligo, in the north-west of Ireland. Their operations include: operation of an abattoir, wholesale of beef, lamb and pork to the catering and hospitality sector, delivery of retail orders to the public, processing of organic beef, lamb and pork.

- **Objective:** to monitor temperature and humidity in the cold storage rooms to reduce food waste ( a loss of meat occurs during the maturing process, especially regarding the parts of meat with more

exposure to the environment) and establish and implement an alerting system that can warn if certain areas do not have the appropriate conditions.

- **Starting date:** to be confirmed.
- **Progress:** -on 23/03/2022: Gautam, James and Xavier carried out a site visit. Cathal Burns showed them the premises, the 2 chill rooms (where they store carcasses) and refrigeration equipment.  
 -The company showed the contamination, seemingly fungal contamination, that they often find growing on the surface of beef as they keep them in the chill rooms.
- **Next steps:** -to install 10 sensors (temp. and humidity sensors):
  - 6 sensors in the big room: 2 at the front, close to the door- 1 on each side of the room; 2 in the middle and 2 at the back. (each sensor roughly 1.6 meters away from the next sensor).
  - 4 sensors in the small room: 2 in the front and 2 at the back.
 -to purchase the equipment (TEKTELIC Kona Micro IoT LoRaWAN Gateway and Elsys ELT 2 Industrial Sensor (Internal Antenna))-> information have been asked to these companies to be included in the UCD supplier's list, then the purchase will have to be drafted.

#### PILOT FRANCE (Omar Dib):

##### **Routhiau pilot:**

- **Progress:** work is ongoing on the stage 2 “the transition between lab and company”, before test in real conditions expected to start in June 2022.  
 -reconfiguration of the positioning of the probe. The focal distance “Z” has been determined. The system is currently functioning.  
 -identification of areas where we can get the best signals. 13 zones selected for the analysis on slopes and flat surfaces. An average nine peaks were present in all positions tested.  
 -differentiation of the signals of plastic from the chicken. 5 peaks have been identified.
- **Next steps:** -To monitor these peaks over 30 days and determine which peaks are affecting mostly the quality of chicken.

**Action: Sasha to add Omar to the REAMIT mailing list.**

## WP T1 meeting, 16/05/2022

### 11 Participants:

Name	Institution
Katarzyna Pelc	BED
Sahar Ahmadzadeh	BED
Ram Ramanathan	ESSEX
James Gillespie	UU
Usha Ramanathan	
Gautam Samriya	ITTRALEE / MTU
Sasha Bennett	NTU
Xavier Cama	UCD
Omar Dib	UoN
Tamiris da Costa	UCD
Gaël Maugis	I&R
Gladys Gallot	I&R

### Absent:

Imke Hermens, Whysor

General information:



All the presentations with update from pilots to be uploaded under the Sharepoint:

**REAMIT Documents > WP T1 Meeting > Slides Meeting 16 May 2022**

## **GENERAL INFORMATION:**

Request from Kate:

### **Action: @All pilot leads**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot lead sends this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.

If a Pilot lead is not able to attend this compulsory meeting, this information should be send (to Kate and me) ahead of the meeting.

### **Agenda:**

- Presentations by pilot leads
- Calendar and inputs requested for the deliverables 3.1; 3.2; 3.3
- Status of each pilot test (Ram)

**Recording:** [https://imagesetreseaux-my.sharepoint.com/:v:/g/personal/ggallot\\_images-et-reseaux\\_com/ETAu1gZzh8JAr4Q8JhtO-SEBcaVMM9AYbJV4lXMtYidOvA](https://imagesetreseaux-my.sharepoint.com/:v:/g/personal/ggallot_images-et-reseaux_com/ETAu1gZzh8JAr4Q8JhtO-SEBcaVMM9AYbJV4lXMtYidOvA)

**Other information:** Imke will be available for the REAMIT project on Tuesday and Thursday in the afternoon. She will attend the WP T1 meetings on Mondays as usual.

### **PILOT NETHERLANDS:**

#### **Picnic pilot:**

- **Starting date:** November 2020

- **Progress:** -on 31/03/2022: a meeting took place with Picnic. The main feeling is that they are not happy with us. They expected something already ready for the market. Whysor made a short action list and after that there was a long silence, despite reminders, until last week.
  - 2 issues regarding the housing of the sensors:
    - Because the sensors are placed in a tote made of styropor, we need to use an adhesive suitable for both hard plastic and styropor. Whysor also want to be able to change the battery of the sensor when needed, so they can't just kit the whole sensor to the tote. Picnic agreed to send a (part of a) tote by next week, so Whysor can do some tests what adhesive to use.
    - The sensor housing appears to be not suitable for use with heavy groceries on top. The first batch of sensors got broken in a period of weeks. Whysor designed a 3D-printed protective ring for the sensor housing. With this ring the sensor was better protected, but still broke down over a longer period. Whysor did not receive proper feedback why the sensors broke down this time. It is their assumption that they broke down again due to heavy groceries. Still have 10 sensors left that are not installed. Whysor is going to test these with 3 instead of 2 protective rings.
- issues regarding the data needed for REAMIT-research: Picnic was at first very careful and not willing to share their data. Last week Whysor received a file with the trip details data they want to share with us (like "planned departure time", "total icepacks per tote") without having to sign an NDA-agreement. Tom will share this information in the next WPT2-meeting. The information Whysor still need is the link between "tote-number" and "tote-key". Whysor sent an e-mail to Picnic and asked for this.
- **Next steps:** -to plan a visit to the Fulfilment Centre in Eindhoven during our next RAC/WP/RSC meeting (Imke will send a reminder)
  - to make some tests with housing sensor, adhesive, styropor tote, etc.
  - to install the next 10 sensors
  - To link data received from Picnic to data from our sensors (e.g. do we recognize a trip in the data, etc.)
  - to start working on the analysis of data coming from the sensors that were working already
- **Point of attention:** Imke said that the communication with the companies has to be very clear, especially regarding the expectations. The companies involved in the pilot test are testing something new, not ready for the market yet. they need to be aware of it to manage their expectations.

### **Van de Huijgevoort Groep pilot:**

Bread, salads and meat processing company for cold cuts and semi-finished products (chicken for salads, minced meat for sausage roll)

- **Objectives:** **1-** to shorten the checks process on the presence of bacteria (listeria, salmonella) and avoid quality product loss (due to freezing and thawing) **2-**to check the production room pressure
- **Progress:** -Julian from Whysor is currently testing 2 sub-pressure sensors from manufacturer DOL. <https://www.dol-sensors.com/products/dol-18-sub-pressure-sensor/>

These sensors are designed for use in livestock facilities. Whysor believe however, that it is also suitable for the purpose we want to use it for at VDHG. There are two types of these sensors. One can measure up to 100Pa and one can measure up to 300Pa.

- **Next steps:** -in June 2022: after finishing the tests at Whysor' offices, they will make some test at VDHG
- **Expected starting date:** still to be determined

### **BIOGROS pilot (Luxembourg):**

Supplier of high-quality organic food

- **Starting date:** November 2021.
- **Objective:** to gain insight on the climatic conditions (temperature and humidity) through the complete supply chain (trucks, warehouse, grower) for several fragile vegetables (mushrooms, onions, potatoes, celery root).
- **Progress:** -on 13/05/2022: Imke, Marco Kull (Whysor) had a meeting with Marco Klinkerfuss from Biogros to discuss the dashboard Whysor is currently making for them and defined the next steps.
  - Christelle Nicolay, as well as the technician we spoke to a few times, left Biogros.
  - Currently we have installed 7 sensors in different areas of their warehouse (e.g. salad department, incoming fresh foods, potatoes, etc.) and 10 inside trucks.
  - Because default settings of the sensors are set to measure and send data every 5 minutes the batteries of a lot of sensors have gone empty in a short time. When Biogros has defined how often they want to measure and receive data, Whysor is going to alter these settings (for example to measuring every 30 minutes and sending twice a day). These will extend the lifetime of the batteries.
- **Next steps (in the next 2 weeks):**
  1. Biogros to define how data are to be measured and sent per sensor. For the trucks we can define different settings, based upon the truck moving or not.
  2. Biogros to define the thresholds for temperature per sensor (e.g. temperature in potato storage may differ from temperature in salad department). Thresholds will be defined as good (green), warning (orange) or critical (red). This is the same method we have used for the Yumchop dashboard.
  3. Biogros to define if they want to receive alerts, when, how and to whom.
  4. Whysor to change the settings of the sensors
  5. Biogros to change the batteries of the sensors
  6. Start with collecting data.
  7. Modify dashboard

+to purchase of 6 extra sensors (to be installed at their growers) – already discussed with Kate.

+ to organise a visit of Biogros with ± 10 people of the REAMIT team on Tuesday 5 July. Patrick Kolbusch, the owner, will offer a tour of the company.

**Landgard (in Germany):**

Landgard is a producer cooperative for flowers and plants, fruit and vegetables in Germany delivering fruit and vegetables from Germany and Europe on a daily basis. *Landgard experiences difference in quality of product (vegetables) between producers. Producer 1 and producer 2 both produce the same product. Producer 1 delivers a product with no quality issues. Producer 2 delivers a product with quality issues.*

- **Objective:** to investigate the cause of the quality difference in the same product between two different growers and thus reduce food waste with the product of producer 2.
- **Progress:**  
 -on 29/04/2022: Marcel had a meeting with one of the technicians of Landgard
- **Next steps:** -Marcel is planning an online meeting with the technician of Landgard to answer some additional questions regarding the technique used. Whysor hope that after that they can install the sensor they still have from the Weyers pilot.
- **Point of attention:** this pilot will have to run fast if we only have until June for the deployment of pilot tests.

**UK PILOT TESTS (Sahar):**

**Human Milk Foundation pilot:**

Human Milk Foundation (HMF), founded in 2017 in UK, is a charity working to help more families feed their babies with human milk.

- **Starting date:** July 2021
- **Objective:** to monitor temperature in which human milk is transported between a donor – Human Milk Bank – Hospital/home; and send alerts if these conditions change.
- **Progress:** -on 30/03/2022 James Gillespie from Ulster visited BED and wired 10 loggers, 10 temperature and humidity sensors and 10 binary sensors.  
 -BED purchased 40 batteries (4 per logger) and Velcro for the 10 sets. All new loggers are visible in Whysor Dashboard.  
 -Loggers were initially reporting data every 5 minutes. James got Marco to push the trip configuration to preserve battery life (hence the readings stopping at 11:45 on the charts). The loggers will now take measurements every hour and upload to the cloud every 12 hours when there is no motion detected, but will log and upload every 5 minutes when motion is detected (aka when the bag is in a trip) to allow for real time monitoring and alerting.
- **Point of attention:** Request to include Kate in future email communication with HMF.  
 +Request to be very careful when communicating with HMF
- **Next steps:** -a visit is scheduled on 23 May at HMF.

**Yumchop pilot:**

UK based company selling frozen food ready to eat (warm food in microwave)

- **Starting date:** 21 December 2020
- **Objectives:** **1-**To ensure that frozen food is stored in the right temperature in the Yumchop food factory. **2-**To ensure that frozen food is transported in the right temperature from Yumchop food factory to where vending machines are located (e.g. NHS hospitals) or to private homes (Yumchop home delivery service). **3-**To provide food fingerprint (i.e. data on the condition in which food produced by Yumchop has been stored and transported).
- **Progress:** - In March 2022 a case study on Yumchop was shared with Abi and Michael Adefisan: 'Some experiences on the use of digital technologies to reduce food waste and improve operational efficiency of a frozen food company – The case of Yumchop Foods in the UK'. -In March 2022 a poster on Yumchop was developed by NTU  
 -In April 2022, before Easter, Imke had several exchanges by e-mails with Abi, mainly about one sensor which is sending too much alerts (maybe wrongly installed). Whysor asked Abi to send pictures but they are still waiting for her answer.  
 Imke suggests that someone have an online call with Marco from Whysor before they visit Yumchop. Marco will instruct how to check installation of sensors when a visit at Yumchop takes place. Maybe the door of the freezer is open or sensor is installed next to the door instead of at the back of the freezer. This will need to be checked at corrected on site at Yumchop's factory by the team visiting Yumchop.
- **Point of attention:** to approach the company carefully not to scare them as they seemed relatively unprepared for the volume of information required by REAMIT during the last meeting on LCA in December 2021.
- **Next steps:** -a meeting is scheduled on 25 May

#### **Blue Skies pilot:**

Company in Bedfordshire, UK producing fresh food, cut where produced and then sent to the UK.

- **Objective:** to monitor temperature in containers in which fresh food is stored during transit by plane from overseas locations in Brazil, South Africa, etc. to UK.
- **Progress:** -Beginning of January 2022 a meeting was organised with them. Blue Skies is interested to go ahead with the pilot test.  
 -5 videos have been sent and uploaded to the Sharepoint (showing how the flow is loaded, what happen at arrival of the containers, etc.). ->according to Whysor this pilot test will be challenging mainly due to connectivity issues Whysor explained that we are facing connectivity issues in some places in the UK (HMF) where internet coverage is very good. We may expect more challenges with connectivity issues in places like Ghana, where we do not know quality of connectivity.
- **Next steps:** -to stop this pilot test after receiving a 2<sup>nd</sup> feedback from Imke (the technology requested does not exist in the market)

**Ongoing action:** Imke to send some information to Kate to decide what the follow up actions of this pilot test should be.

**Glen Affric Brewery pilot (Sasha):**

A family owned Brewery, based in Liverpool, UK, producing canning and distributing beer around the country.

- **Starting date:** September 2021
- **Objective:** To minimise wastage during brewing and maintain the highest quality in beer produce, considering factors such as oxygen levels, gravity levels, temperature and yeast content. Ideally, GA would like to have a system to monitor and regulate the beer – where the sugar content, CO2 content, temperature control etc is all optimized. First issue to be solved: knowing when a beer is ready to be canned. To have better knowledge of what is happening on in the fermentation towers.+ the wasted barley is currently given away as food for animals but can be used more effectively.
- **Progress:** -On 6 January 2022 a meeting was held with JUMO, Whysor and NTU about the selection of sensors to be used for brewing process.  
 -Jumo have offered a temperature sensor and a thermowell.  
 -On mid-January 2022 Marco and Imke had a follow-up meeting with Job Joosten from JUMO regarding the quotation.  
 -No answer received from them since beginning of January 2022.  
 -Despite multiple emails from Usha, Sasha as well as Imke, no update has been received from them (head office, owner, and his son )
- **Next steps:**  
 =>to close this pilot test

**Action: Sasha to send them an e-mail saying they are no longer part of our experiments and that they have to send back the hardware.**

**PILOT FRANCE (Omar Dib):**

**Routhiau pilot:**

- **Progress:** work is ongoing on the stage 2 “the transition between lab and company”, before test in real conditions expected to start in June 2022.  
 -reconfiguration of the positioning of the probe. The focal distance “Z” has been determined. The system is currently functioning.  
 -identification of areas where we can get the best signals. 13 zones selected for the analysis on slopes and flat surfaces. An average nine peaks were present in all positions tested.

- differentiation of the signals of plastic from the chicken. 5 peaks have been identified.
- the quality monitor process started last week and will last until the end of June
- **Next steps:** -To monitor these peaks over 30 days and determine which peaks are affecting mostly the quality of chicken. And then, by the end of June, to start testing in real conditions in the trucks with the company Routhiau.

#### ULSTER PILOT TESTS (James):

##### **WD Meats – Dry ageing trial:**

- **Starting date:** 6th July 2021
  - **Objective:** To reduce weight and quality lost from beef meat during the dry-aging process by installing temperature and humidity sensors to map readings across chambers.
  - **Progress:** -on 10th March 2022, James visited WD Meats to launch the second iteration of the pilot. The things network architecture that we were using as an interface between the sensors and Whysor cloud had been deprecated. Marco had spent a week upgrading all gateways that are maintained by Whysor in late '21, but this gateway was officially commissioned by Ulster so he did not have access to it
    - James took the gateway home and reconfigured it with the new endpoints for the things stack
    - The sensors needed re-paired to the gateway since it was running a fresh install ->after some work all 4 sensors re-paired
    - Tom provided the Webhook details to connect the gateway back to the Whysor cloud.
    - on 30/03/2022, the 4 sensors have been installed at WD meats on a trailer which had been loaded the day before
    - on 25/04/2022: Marc called James to say that the meat was unloaded on 20th April and sensors taken off. He is to calculate the weight loss of each HQ and will send it through to James.
    - no update to report on May 16.
- Next steps:** -WD Meats to provide the measurements of quality/loss at end of dry-aging cycle. They are treating this iteration as the control using the 2/2 sensor configuration over the full 21 day ageing period. They then are going to want to change some of the variables to see how the weight loss is affected.
- Marc to suggest different structuring of carcass's / or temperature / humidity control settings after findings from trial before running experiment again to see effects?
  - **Issues:** -to discover the ideal parameters for the dry ageing process which minimize dark facings while avoids harmful bacteria formulation. There is a statistically significant difference between the front and rear HQ weights due to the refrigeration unit located at the front of the lorry - fluid dynamics?

##### **WD Meats – Clostridium Estertheticum trial:**

- **Objectives:** To strengthen the method of detection allowing for immediate clean-up of surfaces when detected and reduced beef waste in abattoirs, retailers and homes.
- **Progress:** -on 10th March 2022: Clostridium mastermix kit has been ordered and delivered to James Dooley at his lab.



- Clostridium bacteria source at UCD was dead. James Dooley has ordered Clostridium DNA from DSMZ -> he was still waiting for it to arrive on 3<sup>rd</sup> May. James is following up, but still no word.
- WD Meats have purchased a Genesys PCR machine to perform their own swabbing / testing at the factory. Currently they are facing some false negative readings - James Dooley suggested a potential collaboration between UU and WD Meats to help them calibrate the machine.
- On 3<sup>rd</sup> May, James Dooley (and James G) visited WD Meats to discuss clostridium venture. The plan is to verify the reliability of the Genesys machine by running the DNA at the Ulster lab and at WD and ensuring the same results are achieved.
- James Dooley wants to perform a DNA sequencing study to identify the source of the clostridium
- Marc is very interested in this piece of research.
- Results from UU testing should feed directly into this Genesys venture.
- PCR approach will still take upwards of 24h for results, even testing in house.
- **Next steps:** -Need to source clostridium bacteria
- Once we have the CB, the minimum level of detection will be calculated, and Ulster will need to have a meeting with Sensipdx: to check if their equipment is suitable and if so are they still willing to collaborate/how can we incentivise them? (They were originally approached for the capitalisation call). -to wait the results before contacting them.
- **Expected starting date for a pilot test:** not known

**Ongoing action: James to schedule a meeting with Sensipdx.**

### **3DF trial:**

- **Objective:** Use 3DF technology to reduce food waste. 3DF sensors can be used to make determinations of total bacterial count on products or liquids.
- **Progress:** One Fresh Detect sensor has been lent to UCD, which has now been lent to Imke, One Fresh Detect has been lent to Tahmina at BED.  
 -On 17 December 2021, meeting organised with Matthias to discuss the use of FreshDetect for VDH project (for Salmonella, Listeria, etc.)- agreed after consultation that this is outside of the scope of the REAMIT project.
- **Next steps:** -to decide if these activities should be pursued considering Freshdetect is not 3D.  
 -to talk to other companies to find appropriate device for 3DF technologies.
- **Expected starting date for the pilot test:** not known.
- **Continuation/other trial opportunity:**  
 -Discussion initiated with Xavier (UCD) to more fully understand the FreshDetect/ Spectroscopy technology and discussed potential use cases within the REAMIT project  
 -Potential use in the checking of poultry products being delivered to Musgrave Cash and Carry. ->Matthias confirmed that some testing had been trialed through cellophane, however the cellophane would need to be pressed right against the poultry fillet in order to achieve an accurate reading +the freshdetect needs to be used on a flat surface of the poultry for it to produce accurate readings  
 -Jipsy has already tried a similar trial with FreshDetect on packaged chicken with unconvincing results



-James spoke to Matthias about reusing the FreshDetect on commercial kitchen surfaces, such as these at VHG (Dutch company recruited by Whysor). He said that the reflective properties of steel countertops could cause issue. Some exploratory work carried out on a conveyer belt setup in Denmark. University of Bonn was also researching similar.

- Ram thinks that FreshDetect sensor may not be suitable (helpful) for the WD Meats and VHG pilot tests and suggested that Ulster look for a different solution.

- Ulster is planning to recruit in the months to come another researcher specializing in 3DF sensors or spectroscopy (some budget will be available in June)

**-if 3DF is up and running, Trevor has a contact with a company and James has been in touch with a lab at Belfast University working on fish (the last chance to pursue with this pilot test).**

**-no update on May 16<sup>th</sup>.**

### **Musgrave trial:**

- **Objective:** to install temperature and humidity sensors and have an alerting system /cloud upload from Musgrave phone which can warn if food is at risk of spoilage.
- **Progress:** -On 28/03/2022, James visited the facility

-Marco (Whysor) has completed work on trip detection algorithm, using accelerometer data logged by the Eagle device to trigger when the trip has commenced and ended. This algorithm will also be used to improve the battery life of the logger, using 'sleep/wake' information. When no trip is detected, recordings are made every hour and uploaded to the cloud every 12 hours. When accelerometer detects a trip data is recorded and uploaded every 5 minutes.

-Keith, Logistics Manager, explained that each van has both a chill and a freeze zone. He asked if it is possible to monitor both of these zones per logger. James has worked with Marco on adding a second temperature probe; this has involved adding a new sensor which hasn't been trialled by Whysor before (due to limitations of the communication buses).

-James ordered 5 DS18B20 temperature probes. Digital Matter provided a 'working configuration' for the one wire Maxim Integrated DS18B20 to Marco.

->Because they were on 3m cable runs to facilitate temperature monitoring in the rear of the van, they needed a 5v supply. The eagle logger only provided a 3.3v regulated supply.

-Marco and James decided the easiest solution would be to add a 5v step up regulator to each of the DS18B20 sensors. This regulator takes the 3.3v supply and 'boosts' it to 5v. O

**=>On 23/04/2022: James installed the dual-zone monitoring sensors in 3 delivery vans at Musgrave** (videos has been recorded for the REAMIT documentary by Richard)

-Dashboard accounts have been set up for 3 logistics staff members at Musgrave to allow them to monitor the vans.

- **Next steps:** -the two remaining vans need the loggers installed. This has been organized for 28<sup>th</sup> May.  
 -Rule logic for text alerts still needs defined. James will monitor the initial data and help Musgrave decide how long the delay should be before reporting an alert.  
 -Trevor and Robert (Musgrave) will perform interview for Rich –preliminary date : 29<sup>th</sup> June.
- **Expected starting date: ?**

### IRISH PILOT TESTS (Xavier):

#### **Burns Farm Meats (new pilot):**

Burns Farm Meats is an abattoir and farm producer located near the town of Sligo, in the north-west of Ireland. Their operations include: operation of an abattoir, wholesale of beef, lamb and pork to the catering and hospitality sector, delivery of retail orders to the public, processing of organic beef, lamb and pork.

- **Objective:** to monitor temperature and humidity in the cold storage rooms to reduce food waste ( a loss of meat occurs during the maturing process, especially regarding the parts of meat with more exposure to the environment) and establish and implement an alerting system that can warn if certain areas do not have the appropriate conditions.
- **Starting date:** to be confirmed.
- **Progress:** -on 23/03/2022: Gautam, James and Xavier carried out a site visit. Cathal Burns showed them the premises, the 2 chill rooms (where they store carcasses) and refrigeration equipment.  
 -The company showed the contamination, seemingly fungal contamination, that they often find growing on the surface of beef as they keep them in the chill rooms.
- **Next steps:** -to install 10 sensors (temp. and humidity sensors):
  - 6 sensors in the big room: 2 at the front, close to the door- 1 on each side of the room; 2 in the middle and 2 at the back. (each sensor roughly 1.6 meters away from the next sensor).
  - 4 sensors in the small room: 2 in the front and 2 at the back.

-to purchase the equipment (TEKTELIC Kona Micro IoT LoRaWAN Gateway and Elsys ELT 2 Industrial Sensor (Internal Antenna))-> information have been asked to these companies to be included in the UCD supplier's list, then the purchase will have to be drafted.

- **on 16 May:** no progress regarding the purchase of the equipment, the process is very slow (Elsys website shows they are currently out of stock for ELT-2 internal antenna sensors -James Gillespie (UU) informed of another possible supplier). Xavier is in contact with the school buyer (last contact on 13 May), and the supplier and hopes to have the equipment by June.

### -Calendar and inputs requested for the deliverables 3.1; 3.2; 3.3 (Gaël)

**All these deliverables have to be submitted by the end of June**

- **Deliverable 3.1. Working prototypes using sensor technology** -> to mainly focus on the technical part of the pilot because we are supposed to use, adapt or develop new prototypes +we can complement with videos or pictures

**Action:** Sasha to continue the work ongoing on the posters for each pilot test.

**Action:** All pilot lead, to fill in the dedicated template (to be sent soon by Gaël).

- ***Deliverables 3.2. User manual for each pilot test*** -> Sahar has sent the work she has already done (mainly focusing on BED server)

A user manual should reflect how a pilot has been setup. This has to be focus on the point of view of this user/ steps that they have to follow.

**Action:** All pilot lead, to fill in the dedicated template for each pilot test (to be sent soon by Gaël)

**Deliverable 3.3. Report on the pilot test and development of the sensor prototypes:** this is should include all the pilot test story telling templates. Main purpose: to be used for the future publications

**Ongoing action:** All pilot lead, to fill in the template sent by Gladys by 22<sup>th</sup> June.

## WP T1 meeting, 20/06/2022

### 11 Participants:

Name	Institution
Imke Hermens	Whysor
Sahar Ahmadzadeh	BED
Gautam Samriya	ITTRALEE / MTU
Sasha Bennett	NTU
Xavier Cama	UCD
Tamiris da Costa	UCD
Gladys Gallot	I&R

**Absent:** Katarzyna Pelc, BED; James Gillespie, UU ; Omar Dib, UoN ; Usha Ramanathan

### General information:

**-Deliverables 3.1, 3.2 & 3.3 are expected to be delivered in March 2023.** Each pilot test is prompted to continue the work on these deliverables to deliver comprehensive documents by next year.

**-The story telling template has to be fill in alongside with the deployment of the pilot tests as it will be used for scientific research purposes.**

-Regarding the REAMIT Advisory Committee, Work Packages and REAMIT Steering Committee on 6th and 7th July 2022, the WPT1 will have a dedicated time slot. As in January, I will introduce the activities undertaken and I will let each pilot lead present the pilot tests (10min max per pilot test). **Please have a look at the list provided to check the running order of speakers.**

All the presentations with update from pilots to be uploaded under the Sharepoint:

**REAMIT Documents > WP T1 Meeting > Slides Meeting 20 June 2022**

**GENERAL INFORMATION:**

Request from Kate:

**Action: @All pilot leads**

Request to have a short information in written form from each pilot test leader to capture the details of the progress in each pilot test. This will be used to populate an internal document, which records the progress in each pilot test. We are having more pilot tests being developed, and more are in the pipeline, and such a document will help Kate keep track of progress, needs and challenges in case of each pilot test.

Each pilot lead sends this brief information to Kate and me after WP T1 meeting (within 1-2 days), covering all that has been discussed at WP T1 meeting in relation to their pilot test, including addressing questions and providing clarifications.

If a Pilot lead is not able to attend **this compulsory meeting**, this information should be send (to Kate and me) ahead of the meeting.

**Recording:** [https://myntuac.sharepoint.com/:v:/r/sites/NBSInterreg-NWEprojectREAMIT/Docs/WPT1%20Pilot%20Tests/WP%20T1%20Meeting/2022/Slides%20meeting%2020%20June%202022/REAMIT%20WP%20T1%20monthly%20meeting-20220620\\_150415-Meeting%20Recording.mp4?csf=1&web=1&e=8mqxkl](https://myntuac.sharepoint.com/:v:/r/sites/NBSInterreg-NWEprojectREAMIT/Docs/WPT1%20Pilot%20Tests/WP%20T1%20Meeting/2022/Slides%20meeting%2020%20June%202022/REAMIT%20WP%20T1%20monthly%20meeting-20220620_150415-Meeting%20Recording.mp4?csf=1&web=1&e=8mqxkl)

**Landgard (in Germany):**

Landgard is a producer cooperative for flowers and plants, fruit and vegetables in Germany delivering fruit and vegetables from Germany and Europe on a daily basis. *Landgard experiences difference in quality of product (vegetables) between producers. Producer 1 and producer 2 both produce the same product. Producer 1 delivers a product with no quality issues. Producer 2 delivers a product with quality issues.*

- **Objective:** to investigate the cause of the quality difference in the same product between two different growers and thus reduce food waste with the product of producer 2.
- **Progress:**
- on 29/04/2022: Marcel had a meeting with one of the technicians of Landgard
- **Next steps:** -Marcel is planning an online meeting with the technician of Landgard to answer some additional questions regarding the technique used (was supposed to be in May but Whysor is still waiting for an answer). Whysor hope that after that they can install the sensor they still have from the Weyers pilot.
- **Point of attention:** this pilot will have to run fast if we only have until June for the deployment of pilot tests. As Landgard is located very close by Whysor, Whysor will give them the benefit of the doubt (if Landgard answers, the sensors could be installed very quickly).

**Imke: to talk with Ram about the future of the pilot test**

**PILOT NETHERLANDS:**

**Van de Huijgevoort Groep pilot:**

Bread, salads and meat processing company for cold cuts and semi-finished products (chicken for salads, minced meat for sausage roll)

- **Objectives:** 1- to shorten the checks process on the presence of bacteria (listeria, salmonella) and avoid quality product loss (due to freezing and thawing) 2-to check the production room pressure
- **Progress:** -Julian from Whysor is currently testing 2 sub-pressure sensors from manufacturer DOL. <https://www.dol-sensors.com/products/dol-18-sub-pressure-sensor/>  
 These sensors are designed for use in livestock facilities. Whysor believe however, that it is also suitable for the purpose we want to use it for at VDHG. There are two types of these sensors. One can measure up to 100Pa and one can measure up to 300Pa.
- **Next steps:** - in June 2022: after finishing the tests at Whysor' offices, they will make some test at VDHG. Imke will send an email to them right after this meeting.
- **Expected starting date:** still to be determined

**Picnic pilot:**

- **Starting date:** November 2020
- **Progress:** - on 31/03/2022: a meeting took place with Picnic. The main feeling is that they are not happy with us. They expected something already ready for the market. Whysor made a short action list and after that there was a long silence, despite reminders, until May.  
 -2 issues regarding the housing of the sensors:
  - Because the sensors are placed in a tote made of styropor, we need to use an adhesive suitable for both hard plastic and styropor. Whysor also want to be able to change the battery of the sensor when needed, so they can't just kit the whole sensor to the tote. Picnic agreed to send a (part of a) tote by next week, so Whysor can do some tests what adhesive to use.
  - The sensor housing appears to be not suitable for use with heavy groceries on top. The first batch of sensors got broken in a period of weeks. Whysor designed a 3D-printed protective ring for the sensor housing. With this ring the sensor was better protected, but still broke down over a longer period. Whysor did not receive proper feedback why the sensors broke down this time. It is their assumption that they broke down again due to heavy groceries. Still have 10 sensors left that are not installed. Whysor is going to test these with 3 instead of 2 protective rings.

-issues regarding the data needed for REAMIT-research: Picnic was at first very careful and not willing to share their data. Last week Whysor received a file with the trip details data they want to share with us (like "planned departure time", "total icepacks per tote") without having to sign an NDA-agreement. Tom will share this information in the next WPT2-meeting. The information Whysor still need is the link between "tote-number" and "tote-key". Whysor sent an e-mail to Picnic and asked for this.

- **Next steps:** -to plan a visit to the Fulfilment Centre in Eindhoven during our next RAC/WP/RSC meeting (Imke will send a reminder)  
 -to make some tests with housing sensor, adhesive, styropor tote, etc. (in progress in June)  
 -to install the next 10 sensors  
 -To link data received from Picnic to data from our sensors (e.g. do we recognize a trip in the data, etc.)  
 -to start working on the analysis of data coming from the sensors that were working already
- **Point of attention:** Imke said that the communication with the companies has to be very clear, especially regarding the expectations. The companies involved in the pilot test are testing something new, not ready for the market yet. They need to be aware of it to manage their expectations.

### **BIOGROS pilot (Luxembourg):**

Supplier of high-quality organic food

- **Starting date:** November 2021.
- **Objective:** to gain insight on the climatic conditions (temperature and humidity) through the complete supply chain (trucks, warehouse, grower) for several fragile vegetables (mushrooms, onions, potatoes, celery root).
- **Progress:** - on 13/05/2022: Imke, Marco Kull (Whysor) had a meeting with Marco Klinkerfuss from Biogros to discuss the dashboard Whysor is currently making for them and defined the next steps. - Christelle Nicolay, as well as the technician we spoke to a few times, left Biogros.  
 They have installed 7 sensors in different areas of their warehouse (e.g. salad department, incoming fresh foods, potatoes, etc.) and 10 inside trucks.  
 Because default settings of the sensors are set to measure and send data every 5 minutes the batteries of a lot of sensors have gone empty in a short time. When Biogros has defined how often they want to measure and receive data, Whysor is going to alter these settings (for example to measuring every 30 minutes and sending twice a day). These will extend the lifetime of the batteries.  
 -In June, Biogros defined how often data are to be measured and sent per sensor. For the trucks Whysor can define different settings, based upon the truck moving or not. Whysor changed the settings of the sensors. Biogros changed the batteries of the sensors. Whysor started with collecting data. ->Pilot is ready for next steps by analytic.
- **Next steps:**
  8. To continue the work with red/orange/green division of the scale for the dashboard. Biogros has defined the thresholds for temperature per sensor (e.g. temperature in potato storage may differ from temperature in salad department). Thresholds have been defined as good (green), warning (orange) or critical (red).
  9. To start the work with the analytics partners.

+to purchase of 6 extra sensors (to be installed at their growers) – already discussed with Kate.

+ to organise a visit of Biogros with ± 10 people of the REAMIT team on Tuesday 5 July. Patrick Kolbusch, the owner, will offer a tour of the company.

## UK PILOT TESTS (Sahar):

### **Human Milk Foundation pilot:**

Human Milk Foundation (HMF), founded in 2017 in UK, is a charity working to help more families feed their babies with human milk.

- **Starting date:** July 2021
- **Objective:** to monitor temperature in which human milk is transported between a donor – Human Milk Bank – Hospital/home; and send alerts if these conditions change.
- **Progress:** - on 30/03/2022 James Gillespie from Ulster visited BED and wired 10 loggers, 10 temperature and humidity sensors and 10 binary sensors.  
 -BED purchased 40 batteries (4 per logger) and Velcro for the 10 sets. All new loggers are visible in Whysor Dashboard.  
 -Loggers were initially reporting data every 5 minutes. James got Marco to push the trip configuration to preserve battery life (hence the readings stopping at 11:45 on the charts). The loggers will now take measurements every hour and upload to the cloud every 12 hours when there is no motion detected, but will log and upload every 5 minutes when motion is detected (aka when the bag is in a trip) to allow for real time monitoring and alerting.  
 -A visit took place on 23<sup>rd</sup> May at HMF (tour of the premises, presentations, review of equipment-loggers were installed in the bags)
- **Point of attention:** Request to include Kate in future email communication with HMF. +Request to be very careful when communicating with HMF
- **Next steps:**

### **Yumchop pilot:**

UK based company selling frozen food ready to eat (warm food in microwave)

- **Starting date:** 21 December 2020
- **Objectives:** **1-**To ensure that frozen food is stored in the right temperature in the Yumchop food factory. **2-**To ensure that frozen food is transported in the right temperature from Yumchop food factory to where vending machines are located (e.g. NHS hospitals) or to private homes (Yumchop home delivery service). **3-**To provide food fingerprint (i.e. data on the condition in which food produced by Yumchop has been stored and transported).
- **Progress:** - In March 2022 a case study on Yumchop was shared with Abi and Michael Adefisan: 'Some experiences on the use of digital technologies to reduce food waste and improve operational efficiency of a frozen food company – The case of Yumchop Foods in the UK'. -In March 2022 a poster on Yumchop was developed by NTU  
 -In April 2022, before Easter, Imke had several exchanges by e-mails with Abi, mainly about one sensor which is sending too much alerts (maybe wrongly installed). Whysor asked Abi to send pictures but they are still waiting for her answer.



Imke suggests that someone have an online call with Marco from Whysor before they visit Yumchop. Marco will instruct how to check installation of sensors when a visit at Yumchop takes place. Maybe the door of the freezer is open or sensor is installed next to the door instead of at the back of the freezer. This will need to be checked at corrected on site at Yumchop's factory by the team visiting Yumchop.

**-A visit took place on 25 May at their premises with James, Sahar, and Tamiris (visit of the freezers, presentation from them).**

- **Point of attention:** to approach the company carefully not to scare them as they seemed relatively unprepared for the volume of information required by REAMIT during the last meeting on LCA in Dec-2021.
- **Next steps:**

#### **Blue Skies pilot:**

- **Objective:** to monitor temperature in containers in which fresh food is stored during transit by plane from overseas locations in Brazil, South Africa, etc. to UK.
- **Progress:** -Beginning of January 2022 a meeting was organised with them. Blue Skies is interested to go ahead with the pilot test.  
 -5 videos have been sent and uploaded to the Sharepoint (showing how the flow is loaded, what happen at arrival of the containers, etc.). ->according to Whysor this pilot test will be challenging mainly due to connectivity issues Whysor explained that we are facing connectivity issues in some places in the UK (HMF) where internet coverage is very good. We may expect more challenges with connectivity issues in places like Ghana, where we do not know quality of connectivity.
- **Next steps:** - **to stop this pilot test after receiving a 2<sup>nd</sup> feedback from Imke (the technology requested does not exist in the market)**

#### **Glen Affric Brewery pilot (Sasha):**

A family owned Brewery, based in Liverpool, UK, producing canning and distributing beer around the country.

- **Starting date:** September 2021
- **Objective:** To minimise wastage during brewing and maintain the highest quality in beer produce, considering factors such as oxygen levels, gravity levels, temperature and yeast content. Ideally, GA would like to have a system to monitor and regulate the beer – where the sugar content, CO2 content, temperature control etc is all optimized. First issue to be solved: knowing when a beer is ready to be canned. To have better knowledge of what is happening on in the fermentation towers.+ the wasted barley is currently given away as food for animals but can be used more effectively.
- **Progress:** on 6 January 2022 a meeting was held with JUMO, Whysor and NTU about the selection of sensors to be used for brewing process.  
 - Jumo have offered a temperature sensor and a thermowell.

- On mid-January 2022 Marco and Imke had a follow-up meeting with Job Joosten from JUMO regarding the quotation.
- No answer received from them since beginning of January 2022.
- Despite multiple emails from Usha, Sasha as well as Imke, no update has been received from them (head office, owner, and his son)
- **Next steps:**  
 =>to close this pilot test, to terminate and collect sensor installed (1).

### IRISH PILOT TESTS (Xavier):

#### **Burns Farm Meats (new pilot):**

Burns Farm Meats is an abattoir and farm producer located near the town of Sligo, in the north-west of Ireland. Their operations include: operation of an abattoir, wholesale of beef, lamb and pork to the catering and hospitality sector, delivery of retail orders to the public, processing of organic beef, lamb and pork.

- **Objective:** to monitor temperature and humidity in the cold storage rooms to reduce food waste ( a loss of meat occurs during the maturing process, especially regarding the parts of meat with more exposure to the environment) and establish and implement an alerting system that can warn if certain areas do not have the appropriate conditions.
- **Starting date:** to be confirmed.
- **Progress:** -on 23/03/2022: Gautam, James and Xavier carried out a site visit. Cathal Burns showed them the premises, the 2 chill rooms (where they store carcasses) and refrigeration equipment.  
 -The company showed the contamination, seemingly fungal contamination, that they often find growing on the surface of beef as they keep them in the chill rooms.  
 -On 23<sup>rd</sup> May: Elsys provided an estimated date for new stock: 8-12 weeks. Concept 13 did not have the desired sensors (internal antenna version).  
 -On 15<sup>th</sup> June: placed an order for 10x sensors and 1 Gateway from Connected Things (Sensational Systems Ltd.). –awaiting approval and delivery.
- **Next steps:** -to install 10 sensors (temp. and humidity sensors):
  - 6 sensors in the big room: 2 at the front, close to the door- 1 on each side of the room; 2 in the middle and 2 at the back. (each sensor roughly 1.6 meters away from the next sensor).
  - 4 sensors in the small room: 2 in the front and 2 at the back.

### PILOT FRANCE (Omar Dib):

#### **Routhiau pilot:**

- **Progress:** -The Raman system is currently being testing in real conditions (cold room at a temperature of 4-5 Celsius) over a specified period of time (20-30 days= life time of samples) since mid-May 2022. During this period, the product (i.e. Chicken) is being daily analysed by Raman spectroscopy. About 50 spectra per day are being recorded and this will continue over 30 days.
- **Next steps:** -After this stage ends, the results will be analysed and based on the obtained results we can decide if we can advance to the last step of the pilot testing.

### ULSTER PILOT TESTS (James):

#### **WD Meats – Dry ageing trial:**

- **Starting date:** 6th July 2021
  - **Objective:** To reduce weight and quality lost from beef meat during the dry-aging process by installing temperature and humidity sensors to map readings across chambers.
  - **Progress:** on 10 March 2022, James visited WD Meats to launch the second iteration of the pilot. The things network architecture that we were using as an interface between the sensors and Whysor cloud had been deprecated. Marco had spent a week upgrading all gateways that are maintained by Whysor in late '21, but this gateway was officially commissioned by Ulster so he did not have access to it
    - James took the gateway home and reconfigured it with the new endpoints for the things stack
    - The sensors needed re-paired to the gateway since it was running a fresh install ->after some work all 4 sensors re-paired
    - Tom provided the Webhook details to connect the gateway back to the Whysor cloud.
    - on 30/03/2022, the 4 sensors have been installed at WD meats on a trailer which had been loaded the day before
    - on 25/04/2022: Marc called James to say that the meat was unloaded on 20th April and sensors taken off. He is to calculate the weight loss of each HQ and will send it through to James.
    - no update to report on May 16.
    - no update to report on June 20.**
- Next steps:** -WD Meats to provide the measurements of quality/loss at end of dry-aging cycle. They are treating this iteration as the control using the 2/2 sensor configuration over the full 21 day ageing period. They then are going to want to change some of the variables to see how the weight loss is affected.
- Marc to suggest different structuring of carcass's / or temperature / humidity control settings after findings from trial before running experiment again to see effects?
  - **Issues:** -to discover the ideal parameters for the dry ageing process which minimize dark facings while avoids harmful bacteria formulation. There is a statistically significant difference between the front and rear HQ weights due to the refrigeration unit located at the front of the lorry - fluid dynamics?

**WD Meats – Clostridium Estertheticum trial:**

- **Objectives:** To strengthen the method of detection allowing for immediate clean-up of surfaces when detected and reduced beef waste in abattoirs, retailers and homes.
- **Progress:** -on 10th March 2022: Clostridium mastermix kit has been ordered and delivered to James Dooley at his lab.  
 -Clostridium bacteria source at UCD was dead. James Dooley has ordered Clostridium DNA from DSMZ -> he was still waiting for it to arrive on 3<sup>rd</sup> May. James is following up, but still no word.  
 -WD Meats have purchased a Genesys PCR machine to perform their own swabbing / testing at the factory. Currently they are facing some false negative readings - James Dooley suggested a potential collaboration between UU and WD Meats to help them calibrate the machine.  
 -On 3<sup>rd</sup> May, James Dooley (and James G) visited WD Meats to discuss clostridium venture. The plan is to verify the reliability of the Genesig machine by running the DNA at the Ulster lab and at WD and ensuring the same results are achieved.  
 -James Dooley wants to perform a DNA sequencing study to identify the source of the clostridium – Marc is very interested in this piece of research.  
 -Results from UU testing should feed directly into this Genesys venture.  
 -PCR approach will still take upwards of 24h for results, even testing in house.  
 - Clostridium DNA delivered to UU on 17 June.
- **Next steps:**  
 -Validation of Genesig machine at WD Meats experiment: the clostridium DNA will be run at both the UU lab and at WD and checked to ensure the same results are achieved.  
 -The minimum level of detection will be calculated using the clostridium DNA. Ulster will need to have a meeting with Sensipdx: to check if their equipment is suitable and if so are they still willing to collaborate/how can we incentivise them? (They were originally approached for the capitalisation call). –to wait the results before contacting them.
- **Expected starting date for a pilot test:** not known

**Ongoing action: James to schedule a meeting with Sensipdx.**

**3DF trial:**

- **Objective:** Use 3DF technology to reduce food waste. 3DF sensors can be used to make determinations of total bacterial count on products or liquids.
- **Progress:** One Fresh Detect sensor has been lent to UCD, which has now been lent to Imke, One Fresh Detect has been lent to Tahmina at BED.  
 -On 17 December 2021, meeting organised with Matthias to discuss the use of FreshDetect for VDH project (for Salmonella, Listeria, etc.)- agreed after consultation that this is outside of the scope of the REAMIT project.
- **Next steps:** -to decide if these activities should be pursued considering Freshdetect is not 3D.

-to talk to other companies to find appropriate device for 3DF technologies.

- **Expected starting date for the pilot test:** not known.
- **Continuation/other trial opportunity:**
  - Discussion initiated with Xavier (UCD) to more fully understand the FreshDetect/ Spectroscopy technology and discussed potential use cases within the REAMIT project
  - Potential use in the checking of poultry products being delivered to Musgrave Cash and Carry. -
  - >Matthias confirmed that some testing had been trialed through cellophane, however the cellophane would need to be pressed right against the poultry fillet in order to achieve an accurate reading +the freshdetect needs to be used on a flat surface of the poultry for it to produce accurate readings
  - Jipsy has already tried a similar trial with FreshDetect on packaged chicken with unconvincing results
  - James spoke to Matthias about reusing the FreshDetect on commercial kitchen surfaces, such as these at VHG (Dutch company recruited by Whysor). He said that the reflective properties of steel countertops could cause issue. Some exploratory work carried out on a conveyer belt setup in Denmark. University of Bonn was also researching similar.
  - Ram thinks that FreshDetect sensor may not be suitable (helpful) for the WD Meats and VHG pilot tests and suggested that Ulster look for a different solution.
  - Ulster is planning to recruit in the months to come another researcher specializing in 3DF sensors or spectroscopy (some budget will be available in June)
  - Joan spoke to James in June about recruitment of 3DF researcher / contractor. James and Joan to have a call in July about this.
  - if 3DF is up and running, Trevor has a contact with a company and James has been in touch with a lab at Belfast University working on fish (the last chance to pursue with this pilot test).

#### **Musgrave trial:**

- **Objective:** to install temperature and humidity sensors and have an alerting system /cloud upload from Musgrave phone which can warn if food is at risk of spoilage.
- **Progress:** On 28/03/2022, James visited the facility
  - Marco (Whysor) has completed work on trip detection algorithm, using accelerometer data logged by the Eagle device to trigger when the trip has commenced and ended. This algorithm will also be used to improve the battery life of the logger, using 'sleep/wake' information. When no trip is detected, recordings are made every hour and uploaded to the cloud every 12 hours. When accelerometer detects a trip data is recorded and uploaded every 5 minutes.
  - Keith, Logistics Manager, explained that each van has both a chill and a freeze zone. He asked if it is possible to monitor both of these zones per logger. James has worked with Marco on adding a second temperature probe; this has involved adding a new sensor which hasn't been trialed by Whysor before (due to limitations of the communication buses).
  - James ordered 5 DS18B20 temperature probes. Digital Matter provided a 'working configuration' for the one wire Maxim Integrated DS18B20 to Marco.

->Because they were on 3m cable runs to facilitate temperature monitoring in the rear of the van, they needed a 5v supply. The eagle logger only provided a 3.3v regulated supply.

- Marco and James decided the easiest solution would be to add a 5v step up regulator to each of the DS18B20 sensors. This regulator takes the 3.3v supply and 'boosts' it to 5v. O

=>**On 23/04/2022: James installed the dual-zone monitoring sensors in 3 delivery vans at Musgrave** (videos has been recorded for the REAMIT documentary by Richard)

-Dashboard accounts have been set up for 3 logistics staff members at Musgrave to allow them to monitor the vans.

- **Next steps:** -the two remaining vans need the loggers installed. This was originally organized for 28<sup>th</sup> May but Keith rearranged. New planned install date for these remaining loggers is 2<sup>nd</sup> July.  
-Rule logic for text alerts still needs defined. James will monitor the initial data and help Musgrave decide how long the delay should be before reporting an alert.  
-Trevor and Robert (Musgrave) will perform interview for Rich on 29<sup>th</sup> June.
- **Expected starting date:** ?

## WP T2 meetings

### WPT2 meeting on 18/03/2021 via zoom

**(11: 00 am to 12: 45 pm UK time)**

**Participants:** Lohithaksha M Maiyar, Katarzyna Pelc, Ram Ramanathan, Wayne Baker, Fabien Tence, Gael Maugis, Gautam Samriya, Gerard Corkery, Imke Hermens, Joy Eze, Sasha Bennett, Simon McGraw, Tom Verstraten

Lohit presented updates on WPT2 work package deliverables

- D 4.1: UU has established connection of the sensor to the Whysor cloud.
- D 4.2: UU has prepared a document showing the procedure of connecting a sensor they have used for dry aging trial to the cloud.
- D 5.1: A data transfer architecture was drafted by BED and Whysor for transferring data from Whysor cloud to server at BED.
- D 5.4: Three documents prepared by BED and Levstone describing installation and connection procedures for use by BED and technical partners to connect to the cloud

#### Other points

- The purpose of the meeting was to gain understanding of roles of partners for executing WPT2 deliverables.
- Fabien mentioned that SenX is Waiting for UoN to develop algorithms and build data set. UoN have not uploaded data since last few weeks.
- Tom from Whysor mentioned that we will have data in Whysor format, and then convert it to SQL script in a week's time.
- Ram suggested through continuous WP T2 meetings, we should produce consistent outline of what data partners want and what pilot leads can provide. By continuous engagements we hope to achieve consistency. Lohit shall be a central person of information exchange: data analytics partners shall contact Lohit and he will contact pilot test leads.
- Data requirements: Ram said in the next 3 months we will arrive at a common framework for getting data from pilot tests using the data requirements table created by Gautam as the starting point.
- Next meeting will be held on April 16<sup>th</sup> 11:00 am to 12 pm UK time.

**Action for Whysor w.r.t Deliverable 4.2:**

- To send a document describing the approach to connect sensors to the REAMIT cloud through the gateway for each pilot/sensor achieved so far.
- To send document describing different elements of the REAMIT dashboard to be included in the manual.

**Action for I&R, Gael: Request Ali for an update on the data building for UoN pilot**

**Action for Levstone:**

- Working on release of software for the mobile APP
- Get back to BED after discussing with their team on creating second database

**Action for BED**

- To continue work with Whysor to transfer data from Whysor cloud to BED server – first historical data and subsequently in real time.
- To provide data access to SenX –
- Licensing the accesses



## WP T2 meeting on 16/04/2021 via zoom

(11: 00 am to 12: 10 pm UK time)

Participants: Lohithaksha M Maiyar, Katarzyna Pelc, Fabien Tence, Gautam Samriya, Imke Hermens, Joy Eze, Davinder Bola, Tom Verstraten, Yanqing Duan

- Lohit clarified few questions from Tom and Imke on their actions.

### **Action for Whysor w.r.t Deliverable 4.2 (carry forwarded):**

- To send a document describing the approach to connect sensors to the REAMIT cloud through the gateway for each pilot/sensor achieved so far.
- To send document describing different elements of the REAMIT dashboard to be included in the manual.

### **Action for Lohit: Lohit to forward the document prepared by William on sensor connections by UU pilot to Whysor cloud**

- Gael met with Ali to discuss update on the UoN data building and Ali has responded that he is waiting for the statistical model to be developed for further generate the data.
- No update from SenX on data analysis using UoN data.

### **Action: Lohit to follow up with Ali's response on development of statistical model for UoN data building**

- Levstone presented the changes made to the App. The App now has the option to perform user enrolment but will need to be linked with an actual job (for example, Picnic group). In order to do this, they will need further understanding of the data: What data is coming in and how data is coming in.
- Levstone clarified to Kate that building the App is the intermediate stage. Kate requested Davinder to share a description of the different stages involved.
- A meeting on 23 April 2021 was agreed between Whysor, BED, Levstone, SenX and ITT to discuss practicalities of user enrolment.
- On the implementation of the second database by Levstone, this will be later step, they want to sort out the user enrolment first.

- Levstone demonstrated creation of journey in the mobile App. This needs to be linked with the actual pilot.

**Action for Lohit: Lohit will send an invite for the meeting on 23 April, Friday.**

**Action for Levstone: Davinder will send the 2 page description on the implementation steps/stages of their mobile app**

- BED and Whysor finished transferring data from Picnic pilot to Bedfordshire server and will be able to transfer the data for other pilots once the actual pilot test starts.
- BED will work on providing access to SenX and on licensing the accesses for all external users.
- WPT2 action log was discussed and updated.
- Next WPT2 meeting was agreed to be held on 18 May, at 11:00 am to 12 pm UK time.

**Action for BED**

- **To provide data access to SenX (carryforwarded)**
- **Licensing the accesses (carryforwarded)**
- **Kate to contact Ali if he can attend Friday meeting**
- **Lohit will send invite for the next WPT2 meeting**

## WP T2 meeting, 19/06/2021

**Matters arising and actions from RAC/WP/RSC online meetings on 8 – 9 July 2020**

**Updated on 14/06/2021**

Different colours indicate different type of bigger tasks under WP T2.

Date	Minute / Item	Action <i>identified</i>	Responsibility	Update: <i>Confirmation of completion or reasons for non-completion</i>
200709	20.38.03	<p><b>WP T2 – Actions</b></p> <p>REAMIT sub-team (BED, Whysor, SenX, Levstone, ITT) to develop a scenario enabling the REAMIT server to receive and manage other types of data received from all pilot tests (not only data on temperature, humidity and VOC).</p> <p><b>Progress:</b> Discussed the implementation plan in 1 separate meeting b/w the BED Whysor, SenX, Levstone and MTUKerry (previously aka ITT) and in 1 WPT2 monthly meeting. It was decided to create separate SQL instances for every partner and a shared SQL instance which will show the sensor data for download to all partners. BED and Levstone met twice for the actual implementation.</p> <p><b>Sub Action: BED and Levstone will create and configuring SQL instance for Levstone on the REAMIT server. BED to work on provision of access to this instance for Levstone (Completed)</b></p>	BED, Whysor, SenX, Levstone, ITT	<ul style="list-style-type: none"> <li>• Separate SQL instances created for Whysor, BED, Levstone, MTUKerry, and SenX, others are ongoing.</li> <li>• Subsequently, rough historical data from Picnic pilot transferred onto the Whysor SQL instance.</li> <li>• Shared SQL instance creation is ongoing.</li> </ul>

		<p><b>Sub Action: BED will create University network access, SQL instance, access to this instance and Windows server remote desktop access for MTUKerry.</b></p> <p><b>Sub Action: BED will continue and complete the work on BED University network access, separate partner specific SQL instance creation and providing access to this instance for other partners. (Ongoing)</b></p> <p><b>Sub Action: BED will work with Whysor to transfer historical data from Picnic pilot (Completed)</b></p> <p><b>Sub Action: BED will conduct a meeting with all technical partners for opinion and consent for creating and providing access to a shared SQL instance on the server. (Completed)</b></p> <p><b>Sub Action: BED and Levstone will continue and complete creating and providing accesses to shared instance creation. (Ongoing)</b></p> <p><b>Sub Action: BED will work with Whysor to transfer all pilot data from REAMIT Whysor cloud to REAMIT BED server once there is actual data from the pilots (Ongoing)</b></p> <p><b>Sub Action: BED will continue liaising with Softcat on getting licensing quotes to license additional user connections to the server via Windows server remote desktop and to the MSSQL database software installed on the server. (Ongoing)</b></p>		
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200709	20.40	<p><b>BED, Levstone and Whysor to collect data from sensors, including developing step-by-step written procedure for collecting data from each REAMIT pilot test and sensor.</b></p> <p><b>Sub Action: UU to send to Lohit a document describing UU's efforts to connect sensors to the cloud. (Completed)</b></p> <p><b>Sub Action: Whysor to send to Lohit a document describing Whysor's efforts to connect sensors to the cloud. (Completed)</b></p> <p><b>Sub Action: Whysor to send to BED a brief document describing the different elements of the REAMIT dashboard and updates made from time to time.</b></p> <p><b>Sub Action for all pilot test leads: To do the same as above Sub actions, i.e. to send to BED a document describing their efforts to connect sensors to the cloud. (This can be ignored if the procedure is same as in the document sent by Whsyor) (Ongoing)</b></p> <p><b>Sub Action: BED, based on inputs from pilot test leads, to develop an overview of approaches taken by partners to connect sensors to the cloud (Ongoing).</b></p> <p><b>Sub Action: BED will request for updates to the sensor connectivity document from Whysor if there are more connections of different nature from other pilots to the REAMIT cloud.</b></p>	BED, Levstone and Whysor	Ongoing until real data is transfered

200709	20.40	<p>BED and technical partners to develop a template for how WP T1 is connected to WP T2.</p> <p><b>Sub Action: BED and Whysor to update the document in previous action with pilot specific or generalised data transfer procedure from REAMIT cloud to REAMIT Big data hub. (Whysor will need to contribute with data conversion or pre-processing and SQL script creation procedures, BED will contribute to description of SQL instance architecture to receive the data from REAMIT cloud and, store and view the data on the REAMIT Big data hub).</b></p>	BED, Whysor, Levstone.	Ongoing
200709	20.38.03	Levstone to work with Whysor in using Levstone's new platform for REAMIT.	Levstone	Ongoing Working on release of the software , The mobile app
200709	20.41.01	<p>Levstone, to launch the first version of the APP, which gives the ability to connect the sensor and start collect data.</p> <p>Response: this was discussed in 2 monthly WPT2 partner meeting and was decided to start implementation of App for UoN pilot and Picnic pilot. 1 other meeting between Whysor and UoN was held to discuss UoN data conversion</p> <p><b>Sub Action: Whysor will convert UoN sample data to blob format, status: Ongoing</b></p> <p><b>Sub Action: Whysor and BED will work together to deposit UoN data to REAMIT</b></p>	Levstone,BED , Whysor	Ongoing – Connected to previous action –

		<p><b>Big data hub, Status: Dependent on previous sub action</b></p> <p>Levstone to assist Whysor in using this approach with Picnic.</p> <p>Levstone and Whysor to assist other pilot test leads use this approach for other sensors in order to make comparison to see temperature profiles.</p> <p><b>Sub Action: Whysor Levstone and BED will start testing the App on synthetic data from Picnic pilot</b></p> <p><b>Status: Not started</b></p>		
200709	20.41.01	<p>Whysor to provide data Whysor is gathering at the moment through their API and to send it to Levstone's APP. (needs to be slightly rephrased need to work with BED to transfer data from BED server to and from App – feedback from DA to go to Bed and to be taken from Levstone) this required interaction with BA partners, how the will trigger an event to generate. Whysor already have a rule engine, to do this. Forward analytics to their API, in the form of a phone call or email or text message. Response . Meeting with Whysor, BA partner, Levstone and BED needed.</p> <p>Discuss this next week. Existing pilots UoN ?  No data since last weeks. <b>(Completed)</b></p>	Whysor	<p>Remaining parts  For example, mechanism of hosting the data analytics module (client side or server side), mechanism of getting and sending the feedback from data analytics module to the smartphone App and mechanism of displaying the outcomes on the App, alert generation mechanism are all linked with previous action – Ongoing till previous action is</p>

		<p>UoN data a starting point for next weeks meeting (<b>Whysor is doing the UoN data conversion</b>)</p> <p>Can also use shock sensors for exercise with Levstone's App.(<b>Not started</b>)</p> <p>Meeting 11am between, BED, Whysor, Levstone, SenX, ITT, UoN (if available)(<b>Completed</b>)</p> <p>Elaborate different steps for mobile App implementation. Davinder to send a 2page description. Davinder to send before Monday.(<b>Completed</b>)</p> <p><b>Sub Action: After the data from either the UoN pilot or the Picnic synthetic data is ready, Levstone will have a look over the data and see if they can be used for the App.</b></p>		<p>completed (Atleast till data from one of pilots is available on the REAMIT server for access by Levstone in the format they need)</p>
200709	20.40	<p>BED, Levstone and Whysor to develop guidance on managing data collected from REAMIT sensors.</p> <p>Progress: This has been addressed in previous actions</p>	BED, Levstone and Whysor	Ongoing – MTU Kerry has prepared a document on data requirements
200709	20.40	<p>Levstone to propose self-enrolment APP for end-user clients.</p>	Levstone	Ongoing -
200709	20.41.01	<p>Levstone to propose an early version of enrolment (to have a second database). This is to ensure that REAMIT partners have something to show to new companies (to be engaged in REAMIT pilot tests) i.e. to show</p>	Levstone	Ongoing – Levstone will come back after having a chat



		real data so these companies can see what REAMIT can offer.		
200709	20.41.0 1	Levstone to provide information about Levstone's database i.e. how organisations can self-enrol, what information organisations will be required to provide, how customers can access this database	Levstone	Ongoing -- Will come back
200709	20.40	Levstone, BED, Whysor, SenX and ITT to propose how data will be presented to end-user clients.	Levstone, BED, Whysor, SenX and ITT	Ongoing -
200709	20.40	Levstone to develop a web progressive APP for visualisation and data presentation. (Last step)  Take the data and use Whysor dashboard if possible to save repetitive efforts.  Progress: Levstone suggested that previous actions must be completed before we can move to this action	Levstone	Ongoing task- - Under development
200709	20.41.0 1	Levstone to prepare a demonstration about the trial journey idea so that all partners can execute this and generate some data.	Levstone	Ongoing – hoping after a release in a months time
200709	20.41.0 1	UoN to send some data to LM (BED), MS (Whysor) and SM (Levstone) to have a first look at the data.  Action: Lohit followup with Ali	UoN	Completed
200709	20.39	BED to finalise purchase of equipment to build the Big Data hub at BED.	BED	Completed

200709	20.39	BED to finalise purchase of software necessary for the Big Data hub at BED.	BED	Completed
200709	20.39	BED (with the help of ICT at BED) to prepare a room at BED (Luton campus) where the Big Data hub will be mounted.	BED	Completed
200709	20.39	With the help of equipment supplier, BED to finalise building up of the Big Data hub, including installation of software.	BED	Completed
200709	20.40	Whysor to send responses to the questions on data collected in cloud (i.e. Is the common cloud platform going to be Whysor? Will vehicle route data be also transmitted? What is the capacity of Whysor cloud to store data?	Whysor	Completed
200709	20.41.0 1	BED, Whysor and Levstone to come together and make a decision on the best architecture to receive and send data to the cloud, data formatting and method of sharing with partners. The options to consider are to either use the server at BED or the reamit cloud set by Whysor and Levstone.	BED, Levstone and Whysor	Completed
200709	20.41.0 1	Levstone and Whysor to ensure that all sensors used for REAMIT pilot tests are compatible with the smart phone APP from Levstone.	Levstone and Whysor	Completed

200709	20.41.0 1	Levstone, BED and Whysor to decide where data from sensors will reside, in what format it will reside and how it will be shared.	Levstone, BED and Whysor	Completed
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## WP T2 meeting, 10/10/2021

**Attended by Katarzyna Pelc, Sasha Bennett, Gautam Samriya, James Gillespie, Ram Ramanathan, Tom Verstraten, Yangqing Duan, Fabien Tence, Sahar Ahmadzadeh**

### **WPT2 Big Data analytics: Chair: Kate and Ram**

Now that pilot data is being recorded, how are we to approach data analytics?

- What is the approach to data analytics in the REAMIT project?
- How are we going to work together? Who is taking the lead on analytics? How are we going to analyse data from different pilots?
- So far, we will have 10 pilot tests, out of which 4 pilot tests (Picnic, Human Milk Foundation (HMF), WD Meats Dry Aging Chamber and Yumchop) are recording data (or are soon to record data). What about the architectural roles / responsibilities. How are we going forward?

Ram told the group that we have started getting data from HMF. Ram is not keen on assigning specific data analysis roles just yet. Instead, he would like the first pilot data to be handled (cleaned / analysed) by each analytic partner over the next month or so - clean it how you like - perform your own analysis. Then, Ram requests each partner present their initial findings from the data and discuss the techniques that were used to achieve the results. The team can then learn from each other and formulate a plan for the analysis of huge data (i.e. assign workloads for this – dependant on partners volunteering themselves).

Kate asked if we need to develop some kind of protocol – i.e. what we do with the data. Tom mentions that he thinks it's difficult to develop such a protocol when it's so early on. However, he thinks we need to define what we are wanting to achieve by looking at the data - a clear goal is key. Ram said that the information is very clear in the application form regarding what we are wanting to achieve from the data. It states that food waste in terms of frequency / quantity / value should be reduced through big data analysis. WP T2 in the application form gives information on what we want to achieve - the large / overall goal of the work package. Ram suggested all partners look at WP T2 to see what is expected.

Yan said she supported Rams idea but we need to have a clear understanding of the purpose of the data. Tom asked Ram if we should start with the Picnic pilot. Ram agreed. He asked if all partners have access to the data. James said that he did not have access when he tried to access it in July 2021, but would look into it again and contact Joy if he was still having problems. Gautam confirmed he had access to the server - both shared and admin instance.

Tom said for HMF we haven't collected any data yet and so there is no HMF data on the BED's server. Regarding Picnic, Whysor have done a test to check if our script worked, but since then some changes were made. He said he will resync the database on Monday (16/08/2021) so that people have access to the latest data on the BED's server.

Ram said that while we wait for data to be available in BED Big Data hub, we shall start working on data available in the REAMIT Whysor cloud. Each partner shall make a copy of the data on their own machine. Tom suggested in order that we can start with the analysis, as well as syncing to the BED's server, he would send everyone the csv data for the trial in an email.

Tom said that regarding Picnic, he received good news this morning. Imke and Tom went a few weeks ago to visit Picnic, to understand how they would use the sensors etc. At this visit, we installed 4 sensors in 2 crates. These sensors are recording data. This morning Picnic confirmed they had installed the additional 16 sensors in 8 new crates, so the next data export should have data from 10 crates.

Ram requested that secure official university email addresses are used for data to be sent to - not Gmail email addresses. Sahar said she only has a Gmail address at present. Ram said that she will have to wait until she is officially onboarded at BED and gets her email address before she will be able to get access to the data.

Regarding the Dry Ageing trial at WD Meats, Tom checked and said the data stopped recording on 28 July 2021. He asked if James can get the start and end date of the Dry Ageing trial and he will send the data to partners.

Ram shared his screen and presented the objectives of WP T2 from the application form - to use sensor data to make real-time decisions. Data must be cleaned before further analytics. Then, to identify patterns in food transport, food quality, and other sensor data. After this, more sophisticated rerouting algorithms / time series modelling can be investigated depending on partners' expertise. Tom said the general idea of WP T2 is presented at a very abstract level, and actual implementation depends on the pilot and the wanted outcomes of that pilot.

Kate asked if we should discuss how cleaning should be performed. Ram said he wants partners to try it themselves on a small amount of data first and then we can meet and discuss findings. The objectives are such that they can be achieved with reasonable effort. Ram doesn't want to provide any constraints at this stage. We need to compile data from sensors, develop a platform to link suppliers and consumers, analyse sensor data, identify food at risk, and provide decision support to allow food owners to save food. Potential patterns - what is the most common cause of food waste - certain actions that can be taken to reduce this. We cannot speculate at the moment, but with more analytics we will have a better view of what is required

Kate asked if there were any architectural decisions to be made.

- Tom: I think most of the architecture is already in place for it. We have one shared instance, and other partners can get the data from this shared instance and add it to their private instance for analytics
- James: With all partners doing their own initial data investigation, I think everyone can use the tools and technology stacks that they are comfortable with / see fit for the job, and then at the next meeting we can present the techniques we used and see if we want to agree on a unified strategy going forward regarding the implementation.

Ram requested that all partners work with Tom to try to get access to the live data.

### **Website / WP Communications update by Sasha Bennett**

Sasha said it would be great to have an article for the website introducing the Big Data hub - she will definitely need some information to fill about it on the front page of the new webpage. Sasha will also be wanting to write an extensive news article on the Big Data. Sasha proposed that we have a centralised login on the webpage to view links to REAMIT data. It would just be to redirect to the REAMIT cloud website. Ram said if there's no data being stored he would be happy. Tom thinks that it makes sense to have a redirect link as per Sasha's suggestion.

Sasha said she intends to travel to the University of Bedfordshire and get some videos of the Big Data hub. She would additionally like to record a short interview with Sahar once she gets up to speed.

Ram said he is keen to get videos made of each of the pilot tests. He said he will leave it to James / Kate / Tom to decide best how to get the videos from the respective pilot companies (WD / HMF / Picnic) and how to approach these companies for information without bothering them too much.

### **REAMIT Case Studies update by Kate**

Kate give update on case studies. The team focused on 2 case studies - HMF and Yumchop.

- They discussed materials produced by researchers.
- They drafted questionnaires for the companies to gather information required for the case studies. There will be 9 questions for Yumchop and 8 for HMF. Today Kate also sent an email to HMF about the Life Cycle Assessment.
- Next week, Kate will approach them about the interview questions. Yumchop is hoping to install the gateway with Tom's support in the next days.

**Action: James to confirm to Tom the start and end date of the first WD Meats dry ageing trial.**

**Action: Tom to send initial CSV data from Picnic and WD meats trials to all partners who attended meeting today by 13/8.**

**Action: Gautam, Fabien, Sahar, Tom, and James are each going to examine the data, and perform cleaning and exploratory analysis as they see fit. They will each present their employed techniques and findings at next meeting (~15 min presentation each).**

**Action: Kate to organise a follow up meeting of WP T2 on 16 September, 10 am – 12 pm.**

## WP T2 meeting, 22/10/2021, 12:30-14.00

### Attendees:

Sahar Ahmadzadeh (SA), University of Bedfordshire (BED)  
Ram Ramanathan (RR), BED  
Yanqing Duan (YD), BED  
Katarzina Pelc (KP), BED  
Joy Eze (JE), BED  
Gladys Gallot (GG), I&R  
James Gillespie (JG), Ulster University  
Xavier Cama (XC), UCD  
Davinder Bola (DB), Levenshoe  
Gautam Samrriya (GS), MTU (IT Tralee)  
Tom Verstrten(TV), Whysor  
Sasha Bennett (SB), NTU

### Apologies:

Tahmina Ajmal (TA), BED  
Imke, Whysor

Minutes of the WP T2 meeting held on 16 September 2021 were first discussed. All actions included in the minutes have been approved except for the following actions.

- **TV to investigate proper location for the sensors and durability.**
- **TV Get authorisation to get access to the actual data.**
- SA Presentation in the next meeting
- **GS To investigate on acceleration direction effect on the sensors.**
- **DB To Make dimensions of measuring devices meaningful by merging the datasets with the device and operation purposes.**

After checking the minutes, the meeting focused on the agenda. It was noted that there were not much new data coming to the REAMIT server, and hence the initial discussions were focussed on reasons.

TV and Imke had a meeting with Picnic, and their contact person connected them with data science person at Picnic. They will meet with this person next week.

They will obtain from him information about chilled crates not freezers; They will be getting thresholds for various locations such as a truck or fulfilment centre.

Broken sensors at Picnic – They have found a solution on durability issues;

TV: We are printing 3D shells to protect these sensors. New sensors for Picnic shall be arriving today. By end of next week, we will place these sensors at Picnic.

TV: we have been in contact with Picnic and we can use their data; but this is still dependent on a meeting we will have with Imke with data person at Picnic next week.

In Picnic they need to anonymise data that they will share with us.

Hopefully by next meeting, TV will know more about it.

Location of the sensors – at Picnic? TV will make a presentation next time on this.

#### **Action TV:**

At the next meeting of WP T2, TV to make a presentation about location of sensors in Picnic.

- To check data is coming to the server.
- To check the temperature threshold
- Solving durability issues of sensors. In progress of printing 3D shells to protect sensors.
- Will receive 20 extra sensors by the end of next week.
- Once to receive sensors looking for implementation solution
- Getting authorization to get access to the actual data.
- Investigate on the best location of the sensors.
- Make a presentation including some pictures

GS: investigated acceleration of sensors;

GS: in Picnic we have sensors which collect data on acceleration: x, y, z.

- **GS: Action:** To investigate acceleration direction of the sensors

DB: you need to make data meaningful i.e. understand where data is coming from;

- **DB: Action:** Making dimension of measuring devices meaningful. (What it is, what is come from, where it is going) expand more models to incorporate with what is mentioned by DB in the last presentation.

TV: I am expected to deliver the devices and then to put data in the server, and make it publicly available. Once new devices are available for Picnic, TV will connect them to the server. TV will make it publically available.

RR: What is the agenda for today?

- We are expecting all partners to make a presentation.
- RR: Did you check the server whether new data was coming?
- Everybody needs to systematically look at the Big Data server for new data. We cannot rely on TV sending data via email each time.

Partners did not prepare presentations.

**Action to All partners:** At each meeting of WP T2 each data analytics partner to make a presentation on their data analysis and look at the server to see the update.

DB: We can see 30k records in Big Data server at BED, last data is from 18 October. However later he clarified that this was not REAMIT data.

Next week TV will write a script for Picnic data. TV did not have the time to do it for today's meeting.

SA, and JE to be in contact with TV to be sure that data is coming in a regular basis.



Unless we have data flowing regularly to Big Data server, we cannot do this work. everything is dependent on TV. This is a starting point.

KP asking TV if in future data will directly move to the BED big data server or still it will be coming to the Whysor server and then to transfer to BED server?

TV is Making a script to push data directly to the Bedfordshire server, then no more need to use the Whysor API. To do so TV will put data directly into the shared SQL instance after all partners have access to it.

TV: My priority is to make a script to push old data, and automatically push new data to Big Data server. Data will be pushed to SQL instance from where all partners can look at data.

**Action: TV to write a script for Picnic data.**

- Making a script to put historical data, then to test automatic push

DB: TV has got initial raw data; but you need to make it into a story; meta data

1. Get Row data
2. See through what we can use: time, temperature, and etc.

RR: Levstone should also do data analytics, and too investigate if there is any problems and issue with sensor; once all the datasets gathered, then you can work on scenarios. Partners can work on physical scenario, or optimistic scenario. We want to make sure the data we collect is good. If the data says temp is 17 degrees, it is 17 degrees.

Once we have data, we will do quality control analysis.

When you get lots of data, as Whysor is doing, things do can get weird incorrectly.

**GS:** held several trouble shouting sessions with Lohit. If SA and JE face issues with Big Data server, GS can help resolve them; if BED face connectivity issues with Big Data server – GS can help solve these issues.

**Action: JE and SA to work with GS on issues with Big Data server.**

JG has followed this path:

<https://reamit.whysor.com/>  
 login: reamit4nwe@gmail.com  
 password: 7dzgkbNHCBDGBpsw

but he could not see all the data.

TV: After next week, you will be able to get data from the server.

JG confirmed that UU were involved in a dry aging trial with WD Meats. Sensors have to come off a truck each time; it is a big overhead at WD Meats to run this trial. Sensors do not continuously send data. Second trial will be done next week; or when there is staff available; this is extra work for them; they cannot put so much meat in dry aging chamber;

RR: we have to work with WD Meats and adjust to when they can do it.

They do it Ad hoc – previously we did get recording from these sensors. Now, these sensors are sitting in Mark's office at WD Meats. So you are not seeing data from them as they are too far away from gateway.

By having this sensors, WD Meats are having Extra overhead – what are the problems; why companies are not interested in these sensors – what is the issue?

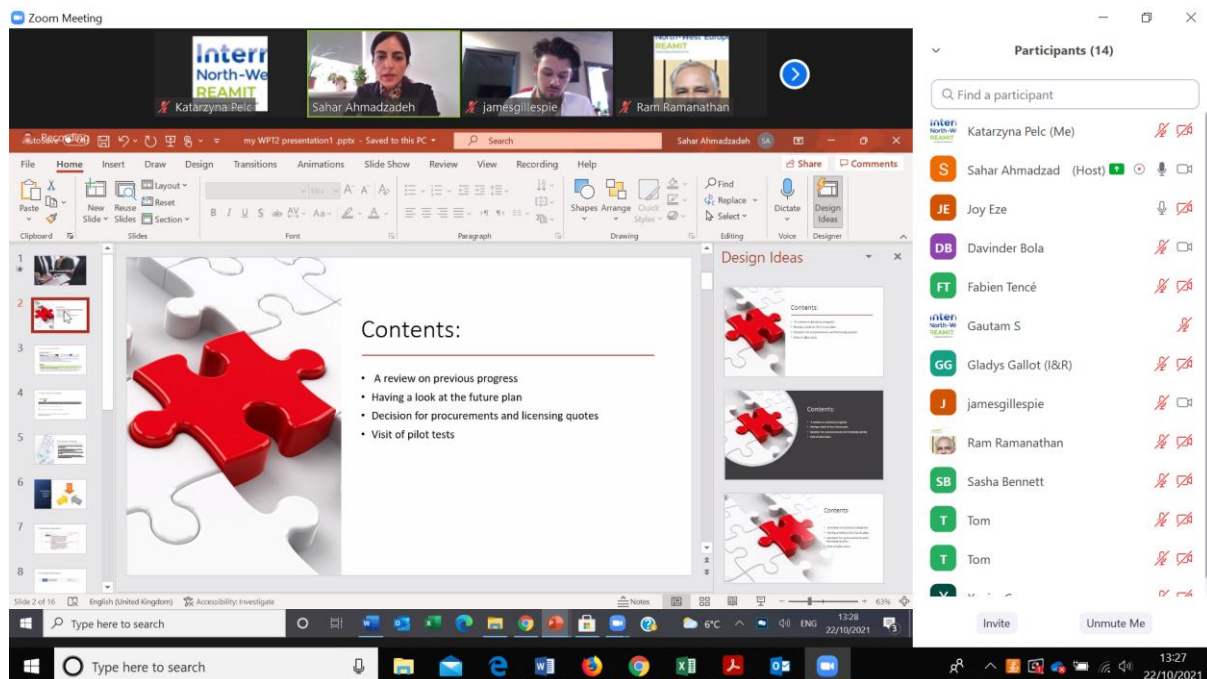
**Action: JG to write a paragraph about why WD Meats do not want to use sensors.**

**Action: KP to collect such information from all companies we work with. As it is not only an issues at WD Meats.**

Covid took ¼ of workforce; from Mark's perspective – they tend to have less staff available; they do not have the time to ask staff member to perform additional tasks. This is additional 4-5 hours of work.

JG contacted Marcel from Whysor several times on which IoT sensors would be available for Ulster for this trial.

JG: To bypass the gateway, he would like to build picnic style data – temperature and humidity; cellular IoT and recording motion. He is interested to solve cellular connectivity issue.



**Actions: SA to analyse data that TV sent previously.**

JE: what is the frequency of data expected / will be coming to Big data server?

TV: it depends on a pilot – TV tries to build real data configuration; some pilots send data every hour, every 10 min; but the aim is to forward it immediately.

RR : Yumchop – sensors are in their fridges (every 10 min, etc.) but data will be coming regularly; from Picnic – it will come only when sensors are put in the van. It depends on the pilot test.

Yan – data flow diagram

**Action: SB, JE and SA to work together to understand how data is coming, and understanding of the frequency of data coming to the server, and also drawing diagrams. To understand Overall architecture of REAMIT Big Data system.**

RR: So we can see what are data sources. What are the hubs? REAMIT hub, BED hub or both. Once we do this architecture, we will understand this data better.

We need to understand – is it coming from Picnic to Whysor cloud; or directly to BED server? We need to wait for reasonably standardised practice to emerge.

DB made a presentation on this in April. He asked to show this presentation to JE.

RR: It is not only about data analytics; but also that data is of high quality, reliable, correct.

RR expressed disappointment that there has not been any new analysis this time.

RR: Still, today's discussion was good, as we are making steps to make sure that what is not available, will be available soon.

RR asked all colleagues collaborate to receive data, and be sure that data is reliable, and also he asked JG to document issues with meat company

KP asked partners to save their presentations in the related folder in the share point.

### **Summary of Actions:**

**TV:** To finish ongoing tasks from previous meeting; check connectivity, authorization, proper location of the sensors and durability of sensors, also to check temperature threshold, write a script, and to provide a presentation,

**SA:** To analyse previous data from picnic

**GS:** To help SA, and JE; To investigate acceleration direction of sensors

**SA, JE, SB:** To look at the data follow and realize how frequently data is coming to the server

**JG:** To write a paragraph about why WD Meats do not want to use sensors

**KP:** To collect information from all companies we work with (Related to above issue). As it is not only an issues at WD Meats.

**JE and SA:** To work with GS on issues with Big Data server.

The date for the next meeting: 23/11/2021, at 11 am – 12:30 pm.



## WP T3 meetings

### Online meeting between BED and UCD, 12/11/2020

Attendees:

BED: Ram Ramanathan (RR), Lohithaksha Maiyar (LM), Katarzyna Pelc (KP)

UCD: Fionnuala Murphy (FM), Shane Ward (SW)

FM said that for each REAMIT pilot test, UCD needs to know type and quantity of food mix in a truck, type of truck, the load of a truck distance travelled by the truck during the duration of the pilot tests. UCD, through the use of sensors, will need to know where/when the food waste starts in the food supply chain and alternative solution (Landfill, regeneration, different store etc.) is being used. They will also need to know the duration of the pilot tests (time) for data collected. The larger the time of study, the more robust is the LCA approach. UCD also needs information on data storage and how data is stored.

UCD will use standard databases to map the amount of CO2 equivalents from each pilot test data.

RR and LM said:

- Data requirements can be different for different pilot tests (i.e. when the pilot test partner company is an online supermarket, a meat producer company, etc. What kind of data you will require for LCA? Each pilot test lead needs clarification on what kind of data is needed from each pilot test as input for UCD's work.
- Every pilot test has one food category. We need a list of variables for each pilot test/food, as well as specification of the format in which UCD need data on these variables.
- It will help each pilot test lead if UCD develops a standard template that says what data is needed from each pilot test – this includes both: standard data for each pilot test and pilot test specific data.
- LM suggested the template could be developed considering classifying pilot tests around the type of scenario (for example, warehouse/onsite pilot or transportation/moving pilot), type of food (single commodity transport, multiple commodity transport etc), or type of REAMIT technology used (cyberbar, bacterial swabbing, temperature monitoring etc.) The idea is for each pilot test lead to understand which data is standard/common for each pilot test and which data is pilot-specific based on different situations as mentioned above.

FM confirmed she would develop a general template for data collection from all REAMIT pilot tests and shared it with the REAMIT team at the beginning of December 2020.

UCD also needs to know how many scenarios would run and at what point in each pilot test, the analysis would start.

**Action: FM to develop a general template for data collection from all REAMIT pilot tests. The template will specify standard data from each pilot test and pilot-specific data from each pilot test.**

FM confirmed UCD was recruiting two persons for two full-time 100% REAMIT related positions at UCD. Hopefully, both persons will join REAMIT team at UCD in spring 2021. Currently 3 persons work on REAMIT at UCD (part-time) – SW, FM and Nick Holden.

RR confirmed that UCD pilot test currently does not seem to track temperature. He asked if cyberbar pilot test would be adjusted to address REAMIT requirements i.e. tracking of food quality with use of standard sensors measuring temperature, humidity, location.

SW confirmed that the intention was to monitor temperature along supply chain in cyberbar pilot test. Ireland is at level 5 of Covid lockdown, which means that you stay at home. You could run pilot at level 2, not sure if we could run pilot tests in level 3. Hopefully, both post-docs will be in position to start pilot tests in spring.

FM confirmed they would work with Manor Farms for cyberbar pilot test. Manor Farms are still committed to REAMIT pilot test.

Dymitrios at UCD has looked into a new REAMIT pilot test focusing on reducing mushroom waste. This could be explored in a new pilot test in Ireland.

SW confirmed that as soon as two PhDs join UCD REAMIT team, the opportunities to do tests in UCD will be big. UCD will be able to take the model and apply it elsewhere.

SW confirmed that the next RSC meeting scheduled on 20-21 January 2021 would be hosted online by UCD, due to COVID-19.

**Action: KP to liaise with SW and FM on developing the next round of REAMIT meetings hosted online by UCD in January 2021.**

FM confirmed that UCD spoke with SEUPB (FLC organisation in Ireland) and they knew about REAMIT as they also audited ITT. UCD will check what amount they would be claiming now (in Dec-2020) and confirm this to BED. If this amount was relatively small, UCD would not claim this time and BED would discuss this with JS.

**Action: SW and FM to send to BED by end of December 2020 the estimate of costs incurred so far by UCD in REAMIT (from the beginning of the project in January 2019 until Dec-2020). If the amount is low compared with the cost of FLC audit, BED will approach JS to explain why UCD will not claim also this time.**

## WP T3 meeting, 22/03/2021 from: 11:00 to 11:30 UK time

### Attendees:

- Ram Ramanathan
- Lohit Maiyar
- Sasha Bennett
- Katarzyna Pelc
- Yanqing Duan
- William Duffy
- Elaine Ramsay
- Joan Condell

### Apologies

- Gael Maugis
- Fionnuala Murphy

### Agenda:

- Involved partners
- Meeting Schedule
- Application form
  - Summary outputs
  - Deliverables
- Outcomes
- AOB

### Summary:

- William presented the apologies for Gael and Fionnuala.
- A discussion was held on which partners should be involved in these meetings. William listed the partners he had invited, and Ram advised that the only partners who should attend are those who will be working towards WP T3, otherwise they will get nothing from the meeting.
- Next point of discussion was the schedule of which these meetings would occur. William said that he would be looking for a regular slot from this point on and expected that these meetings would happen once per month. **Action: William to find a regular slot and create a monthly meeting**
- To add context to these meetings, a summary was given of what these meetings should provide. With the idea behind WP T3 to bring the outcomes of WP T1/T2 closed to the market and allow the development of business cases up to TRL 8. The main objectives of WP T3 are to understand the

develop the technology potential of any REAMIT equipment. To further develop this technology towards a consumer grade system and to finally attract future end-users.

- A summary was provided of each of the roles in WP T3 and the partners involved in those roles. The WP lead is Ulster University (UU). Technology assessment will be performed by University of Bedfordshire (Beds), Nottingham Trent University (NTU) and University College Dublin (UCD). Sustainability and Life Cycle Assessment will be performed by Beds, NTU and UCD.
- The four main activities were summarized along with their deliverables. It was proposed that for the next meeting, a breakdown of each of these deliverables into achievable steps is required. **Action: UU to break down of the deliverables into smaller steps for further discussion at next WP T3 meeting**



## WP T3 meeting, 13/05/2021 from: 15:00-15:30, Zoom voice call

### Attendees:

- Ram Ramanathan
- Lohit Maiyar
- Sasha Bennett
- Katarzyna Pelc
- Yanqing Duan
- William Duffy
- Elaine Ramsay
- Fionnuala Murphy
- Tamiris da Costa
- James Gillespie

### Apologies

- Joan Condell

### Agenda:

- Summary of WP
- Meeting schedule
- Activities

### Summary:

- William provided introduction to a new member of staff joining from Ulster University, James Gillespie.
- Fionnuala provided introduction to a new member of staff joining from UCD, Tamiris da Costa. Tamiris said she will be assisting in the development of the LCA for WP T3.
- William provided an introduction to the work package for the new members of staff.
- Activity 1 was discussed, with William stating that they have been interviewing companies to understand the technical landscape of food waste better. Fionnuala said that for the LCA and technical landscape we need to understand where the food waste is occurring, quantifying this cost and the cost associated with this waste as this will all feed into the LCA. Fionnuala said that the review will be in literature and potentially surveying the pilot leads. Ram said that a special focus should be on the REAMIT technologies, the opportunities for reducing waste in supply chains and keep a specific focus on the sensors, analytics used. It is important to have input from the businesses on this also. Kate asked where UCD would survey. Fionnuala responded that it would be a general survey so that the food waste occurring could be understood. These surveys could then be related to the pilots within REAMIT and have a discussion with each of the individual pilot companies.
- Yanqing asked if there should be a formal definition of what REAMIT technologies applies to. Ram responded that we need to define this, but it could be the combined approach of sensors, analytics

and its application to supply chains. Elaine said that possibly REAMIT toolkit and Ram said possibly REAMIT approach.

- Future scheduling of WP T3 meetings was discussed, with every two months being sufficient until work starts to speed up. Meetings will be 1 hour long in future.

#### **Actions**

- **Change frequency of WP T3 meetings to once every 2 months and make it an hour slot**
- **Create a definition for REAMIT technologies**

## WP T3 meeting, 17/11/2021, 11:00-12:00

Attended by James Gillespie, Tamiris da Costa, Xavier Cama, Sahar Ahmadzadeh, Katarzyna Pelc, Ram Ramanathan, Usha Ramanathan, Sasha Bennett, Trevor Cadden, Joan Condell, Daniel Kelly, Elaine Ramsey, Pratheepan Yogarajah, Gladys Gallot

Hosted online via Teams.

### Agenda

1. Work Package overview (as per application form)
2. Updates on work completed thus far per deliverable

### **WPT3 Activity 1: Risk, technology and sustainability assessments of REAMIT technologies (led by UCD with support from NTU, UU and BED)**

There are two deliverables for this activity; D3.1.1, due for completion Sept 2022, and D3.1.2, due for completion July 2023.

### **D3.1.1: An assessment report of REAMIT technologies including a comprehensive systematic review (mapping) of the technical and business landscape in the fresh produce food chain.**

Prior to James joining the REAMIT project, a whitepaper was prepared by the Ulster team outlining potential sensor technologies which could be used in the fresh produce food chain. James asked if it would be appropriate to use the findings to contribute to the technical landscaping aspect as it sounded like a good fit.

- Daniel (DK) and Bryan (BG) authored the paper, outlining potential uses of sensor technology for food waste reduction.
- It had been prepared as a journal paper but hadn't been accepted for publication. It hasn't been used for anything else on the project
- This whitepaper could be used as the foundations to build out the rest of this deliverable. James said it is likely more work will need done investigating the business landscape and identifying what type of agri-food businesses perhaps best suit the use of sensors.
- Tamiris said that Finnouala proposed that the UCD team (Tamiris and Xavier) start a review paper covering sensors and LCA, which they have started. She has a copy of the review paper written by UU.
- Tamiris will check with Finnouala to see what deliverable she intended this piece of work to fit under.

**Action: examine the whitepaper and see what could be used for the systematic review.**

**Action: check with Finnouala her plan for the review paper being prepared by Tamiris and Xavier. Is it for D3.1.1?**

### **D3.1.2: The life cycle assessment system will allow environmental impact data to be integration with REAMIT IoT sensor and big data solutions.**

Tamiris has already started work on the life cycle assessment. Tamiris give update:

- 5 questionnaires have been prepared for data collection required for LCA covering production, manufacturing, storage, distribution, and retail. Some of these will be completed by pilot leaders, and some will be completed by the pilot companies. We need to know the food waste, temp, humidity, and link these with food waste avoided, amount of food produced, transported, type of vehicle, fuel, average transportation distance etc. some of which pilot leaders will not know, hence cooperation with pilot companies is vital.
- UCD/ BEDS had a meeting at end of August with HMF explaining how LCA would be performed and explained the benefit and importance of performing this activity. This meeting was not as successful as they hoped as the LCA was not mentioned when HMF were agreeing to join the project. HMF are already carrying out an LCA study on the company and the data has not been published, so they aren't comfortable to share this data yet.
- The next company to be approached will be yumchop and we hope to have better luck with this company.
- Ram is not sure HMF's collected data, even when it becomes available, will have the detail that we need. Ram suggests that we should be proactive and collect data from secondary sources as much as possible by contacting sensor manufactures, installers, etc. and make some reasonable assumptions so that there are no delays in the LCA work.
- Tamiris said we can start collecting data from literature but it would be nice to include details from companies – the delay so far has been waiting on the green light to approach other companies.
- James asked was there a target in mind for LCA case studies as per the application. Ram said that LCA should be performed on each pilot test ideally, and that the application promised 5 pilot studies. Therefore, LCA needs to be conducted on at least 5 companies. We are aiming to have 15 pilot studies now, and ideally we would have one for each, but the minimum will be 5.

### **WPT3 Activity 2: Future-proofing REAMIT technologies (led by UCD with support from BED)**

There is one deliverable for this activity; D3.2.1, due for completion July 2022

#### **D3.2.1: Current and identified future REAMIT technology assessment report**

James mentions that after speaking to Tamiris last week, the UCD team's idea is to utilise questionnaires for this deliverable

- Work has not begun on this deliverable yet. Tamiris wanted to gather the opinions of other partners on the best way to approach this. Her idea is to produce a survey / questionnaire to understand how the users are perceiving these sensors.
- What type of users should be included: is it companies or consumers? What type of detail do you want to include in this report as we do not want to duplicate what is going to be included in activity 1.1
- Ram: The customers are actual food companies who will be using the REAMIT technologies. We can use a survey to find out how they find the usefulness of REAMIT technologies. We do not need to

limit ourselves to only the companies involved in pilot studies but any company who is using sensor technologies in their business.

- We have already started work in Beds with Yan in questionnaire development for the perceived usefulness of technologies. This is a classic information systems study -adoptions of technologies, how customers are finding it, and what are the barriers to adoption.
- We can focus on our own pilot test companies on how they find the technologies; are they going to be useful to them now or in the future, and where they want to go next. Pilot test companies can help give us ideas on the future.
- Ram: IoT and big data are technologies of 2010's. Are there any ideas in the 2020's that could be applied for the reduction of food waste – this is what we meant by future proofing. Is there any new technologies coming in the pipeline that could be applied to technologies in the future.
- Tamiris: we can start once we have some results. We need to wait until they have seen the usefulness of the sensors before they can provide opinions on actual usefulness?
- Ram: I suggest UCD have a meeting with Yan re. questionnaire development. Please work with Usha and her team on case study development where specific questions will be asked to pilot companies on how they are finding REAMIT technologies and how they could be improved.
- Elaine added that as we are doing qualitative data collection, should we produce a standardised template that would inform the type of questions that would be asked across each of the companies? This would supplement the survey data; it would be very thorough as we would have both qualitative and quantitative data which could help for future paper writing etc.
- Ram said that he supports standardised questions to ensure that the results are rigorous and publishable in journals. Ram asked if Elaine would work with Usha to produce a qualitative questionnaire that can be applied to each pilot company
- Usha said she has tried a standardised questionnaire approach but it did not work very well as HMF and yumchop are two very different companies. Usha will discuss with Elaine further in a separate meeting about qualitative research

**Action: Organise meeting with Yan to discuss questionnaire development with UCD**

**Action: Organise meeting with Usha on questions to ask pilot companies for case studies that will feed into this deliverable.**

**Action: Organise qualitative meeting between Usha / NTU and Elaine / UU.**

### **WPT3 Activity 3: Market assessment (led by UU with support from BED, Valorial, I&R & NTU)**

There is one deliverable for this activity; D3.3.1, due for completion July 2023

#### **D3.3.1 Market readiness report**

James asked Ram if this deliverable is linked to the findings from the pilot studies

- Ram: its less about the pilot companies and more about the future proofing of technologies which are on the market at the minute. What exactly would be required to get technologies to the level of a spin out ready to market REAMIT technologies to agri-food businesses
- There was a Belgian firm trying to put together a commercially available package; this is what I had in mind. Imke discovered sensors were being damaged in the picnic trial and made 3d printed

housing to protect the sensors. Is it possible for a company to produce a crate with housing and sensors installed? Are technologies in the position where a company could come tomorrow and produce services and market it?

- James asked was MRL level 8 mentioned on the application form. Ram said MRL was not mentioned, but TRL was discussed with the target achieving level 6-7/8. MRL and TRL use almost same scale, we just didn't use that terminology. Ram thinks we are on course for achieving 7/7.5.
- Levstone talked about commercially available product. For the capitalisation call, they were going to produce a box which would contain all the sensors required. They were going to send it to any available food producers in the UK and whoever wants to use it could just scan a QR code which would connect them to levstones cloud. The plan was to do it without cost to companies and get funding from the capitalisation call – unfortunately this didn't work out. You can speak to levstone about this system and other systems currently commercially available.
- Elaine: in terms of MRL report, do we have an memorandum of understanding / obligation to sensor suppliers in terms of what were able to offer. Thinking about the intellectual property of sensors – are we free to offer solutions that are commercial solutions that we don't have ownership of within the project?
- Ram: We are only using commercially available sensors in the project – we are not developing our own sensors in the project. Therefore, we don't need a memorandum of understanding. We are not looking at a specific sensor manufacturer, rather what are the new technologies coming up in the market. Is it possible to produce a package based on existing sensors? We are not developing anything new; rather it is about assembly and producing a service that businesses will need.
- Elaine: In the report, we can make suggestions about types of sensors to be used but we won't use specific names of providers, we will keep it general? Ram says this is fine.

**Action: James to talk to Levstone about commercially available systems.**

#### **WPT3 Activity 4: Development of a business case (led by UU with support from BED, Valorial, I&R & NTU)**

There are two deliverables for this activity; D3.4.1, due for completion July 2023, and D3.4.2, due for completion July 2023.

James said that this activity is likely to take place after pilot studies have been conducted and analysis have been performed as these deliverables will inform the business case. Ram said that yes, the activity is meant to be a cumulation of everything that we do in other work packages; it is a synthesis from what we have learnt in WPT1, WPT2, and WPT3. In some sense it will depend on the findings from these activities; this is why it is ending in July 2023.

##### **D3.4.1 Business prospectus**

- What are the benefits of technologies, where it is going and what can be further done. It is showcasing what we have achieved in a nice way.
- You can wait until middle of next year before progressing it
- Ram suggests that we continue looking at the business landscape to help inform the deliverable.

- Elaine: our main aim here will be to demonstrate that the technologies are capable of being scaled up and transferrable between different sectors in the agri-food business. If we can demonstrate this it will be a very good output from the project
- Ram: I will leave it to the Ulster team to develop the prospectus and we can develop it together.

#### **D3.4.2 Business case for achieving 40,000 tonnes of waste reduction**

**Next REAMIT WPT3 meeting to be scheduled on 15 Dec 2021 at 11.00 AM.**

## WP T3 meeting, 15/12/2021, 11:00-12:00

Attended by James Gillespie, Tamiris da Costa, Xavier Cama, Katarzyna Pelc, Sasha Bennett, Joan Condell, Daniel Kelly, Elaine Ramsey, Pratheepan Yogarajah, Gladys Gallot  
Hosted online via Teams.

### Agenda

1. Review action points from previous meeting
2. Updates on each activity

**Action for Tamiris / Xavier: examine the whitepaper prepared by Ulster and see what could be used for the systematic review.**

Xavier said he remembers that there are parts of the whitepaper which could be used but he has not had a chance to review this since the last meeting. We will keep as an ongoing action.

**Action for Tamiris: check with Finnouala her plan for the review paper being prepared by Tamiris and Xavier. Is it for D3.1.1?**

Tamiris has been busy organising the symposium but will be working towards this activity in the next weeks as Finnouala has a deadline for the end of January. Tamiris believes it will be used for activity 1.1 as we have the LCA case studies for 1.2 – at least 5 as Ram said in the last paper. Also, since the paper involves sensor technologies it could be used for the 1.1 deliverable.

**Action (ongoing): double check with Finnouala to ensure the paper being prepared is for 3.1.1**

**Action for Tamiris: Organise meeting with Yan to discuss questionnaire development with UCD**

Not yet. Tamiris plans on finishing the paper before talking to Yan so probably won't happen in the next month. Ongoing.

**Action for Tamiris: Organise meeting with Usha on questions to ask pilot companies for case studies that will feed into this deliverable.**

Ongoing. Tamiris asked if the meeting with Yan and Usha are the same meeting. James said that Yan is preparing the quantitative questionnaire while Usha is working on the case study. Tamiris proposed we include Usha in the meeting with Yan.

**Action for James: Organise qualitative meeting between Usha / NTU and Elaine / UU.**

James is yet to organise this – it will be the new year before a doodle is sent out for this. Elaine requested Trevor is also invited to this meeting as he had been in touch regarding a protocol for the case study.

**Action for James: James to talk to Levstone about commercially available systems.**

Ongoing – an action to be revisited in a couple of months' time after the Market Readiness Report template has been prepared and James has had a chance to think of questions to ask Levstone to capture the data he needs for the report.



**WPT3 Activity 1: Risk, technology and sustainability assessments of REAMIT technologies (led by UCD with support from NTU, UU and BED)**

**D3.1.2: The life cycle assessment system will allow environmental impact data to be integration with REAMIT IoT sensor and big data solutions.**

Tamiris provided updates for this deliverable. HMF LCA study – no updates since end of August. They agreed to send their LCA study to Tamiris as soon as its published but she hasn't heard anything yet. For Yumchop, UCD had a meeting with Whysor, Abi and Micheal about the Dashboard (18<sup>th</sup> Nov), and during this meeting the LCA was mentioned. On 10<sup>th</sup> Dec, Tamiris met with Kate and Yumchop, where Tamiris introduced the concepts of LCA and the benefits of performing such an activity. Abi explained the process involved in the production of food at the Yumchop factory, but no data has been collected yet as it involved the analysis of records. Kate suggested questions are sent to Yumchop in advance and to slip them into smaller chunks; then hold a monthly meeting to collect the data.

Tamiris is first going to focus her LCA on the food storage stage performing a gate-to-gate LCA, because the sensors were installed in this stage. If this is successful we will try to collect more information from them about their other phases.

Tamiris has contacted some sensors manufacturers and installers this week for data required for the LCA.

Kate observed that the amount of detail required for LCA shocked Yumchop – they don't have the resources, and don't have the information off the top of their head. We need a thought through strategy for how to approach companies requesting this quantity of data without losing them. Kate thinks that if it was clear from the start the level of detail required for the LCA study, neither HMF or Yumchop would have agreed to run a pilot study for the project. Kate asks if more senior colleagues could help refine a strategy for this data collection. Joan said that its quite hard, but it's more a case of building the relationship and not asking too much too quickly. Joan doesn't think there's any easy way around it, we just need to let them know it's coming. Joan asked if there was any way we could find out some of the information online instead of asking it to the company. James said that Ram had proposed collecting secondary data at the previous meeting but Tamiris needs very specific information which only the company will know e.g. input (raw materials), quantities used etc. Tamiris said she will try to collect total inputs at the next meeting, and use online for sensor information.

James suggested that we should check with Ram the strategy going forward – should we tell them during the pilot recruitment stage that a mandatory step of the pilot is participating in an LCA study? James suggested that since there are only 5 mandatory pilots, there is only going to be 5 mandatory LCA studies, and that since we have upwards of 15 pilots in the works at the moment perhaps we can perform LCA studies with the more co-operative companies. Tamiris thinks that WD meats should be a simple LCA to complete since the only inputs are electricity and Meat, whereas Yumchop has many more inputs since they are dealing with various meat products. Xavier asked if it would help to highlight the benefits of the LCA to companies to help with their cooperation. Tamiris said she has tried to do this during the meeting but she is not sure it is enough to convince them to share the data.

James suggested that we do a brief outline of each pilot to identify and prioritise which pilots will be easier to perform an LCA on. Check with Ram to see what he thinks of this.

**WPT3 Activity 2: Future-proofing REAMIT technologies (led by UCD with support from BED)**

No updates so far on this activity.

**WPT3 Activity 3: Market assessment (led by UU with support from BED, Valorial, I&R & NTU)**

Ulster team had an internal meeting around the market readiness report a couple of weeks ago and discussed the requirements of a market assessment report and what we would need to include in it. Elaine has started to draft the start of a template for a Market Assessment Report outline sections and what will need to be included in each section. Elaine has also started to identify what data we are going to need to collect for this report. We have discussed performing a SWAT analysis on each company which will be included in the report. Trial data will also be included in the report although this will feed in later. James will start fleshing out the template over the next month. The whitepaper prepared by Daniel and Bryan should be useable at the start of the MRL report to introduce various sensor technologies which exist on the market. Elaine said that we need to be cautious not to overburden the pilot companies when it comes to data collection; we will need case study data for the market readiness report which will be separate to the LCA data. We do not want to put companies off by asking too much from them, so we should think about what data we might need for this report now so that we can try to work these questions in to meetings that are already occurring with pilot companies. It's also possible that we ask these questions as a questionnaire in an email, although this may not always have the most follow through.

**WPT3 Activity 4: Development of a business case (led by UU with support from BED, Valorial, I&R & NTU)**

No updates since this WP is mostly a cumulation of most of the other REAMIT project outputs.

**Other comments**

Kate said that a way forward could be to have monthly meetings (1.5h?) with each pilot company to collect information that we need from them gradually. Elaine said she wouldn't be sure to committing them to a monthly meeting to ask them questions in that kind of a setting – is there a softer approach that could be used instead? It would be very difficult to get WD meats to commit for 1.5h a month for example, but perhaps it would work for some other companies. Joan agrees with Elaine – the company will normally work with you when you need them to but getting them committed to a monthly meeting could be difficult. Joan suggests a hybrid approach for data collection could be explored, using interviews but also providing questionnaires. James suggests that you could feel out each company and gauge what sort of guidance / level of partner involvement they would like, and treat each pilot on a case by case basis.

Ram: How would you like to proceed in order to keep companies engaged and to ensure we are receiving information from them in a timely manner?

## WP T3 meeting, 16/02/2022, 10:00 – 11:00

Attended by James Gillespie, Ram Ramanathan, Yan Duan, Tamiris da Costa, Xavier Cama, Katarzyna Pelc, Sasha Bennett, Daniel Kelly, Elaine Ramsey, Pratheepan Yogarajah, Bryan Gardiner, Gladys Gallot

Apologies: Joan Condell, Trevor Cadden, Usha Ramanathan

Hosted online via Teams.

### Agenda

1. Review action points from previous meeting
2. Updates on each activity

**Action for Ram: At last meeting, we discussed how best to ensure company cooperation with LCA work – should it be mentioned during trial recruitment? Should we prioritise LCA based on how simple we think a pilot is (we only need 5)?**

**Action: Ram. Kate suggested scheduling a monthly meeting for data collection with each pilot. Some partners thought this would be too much and that we need to be careful with how we approach them so they don't lose interest. Do you have a desired strategy for this or should it be evaluated on a case by case basis?**

Ram has encouraged Tamiris to visit the five pilot test sites who we will be performing LCA analysis on in the first instance and spend some time observing operations, gathering information etc., allowing for a more hands on experience with each company. It is thought that by spending a few days on site with each pilot, Tamiris will be able to collect all the data she needs, through either observations or questions. Finnouala @ UCD has also approved of this plan. Ram has also requested that Tamiris uses the time on site to capture relevant pictures and videos which may be used for case studies, communication material etc. Tamiris should liaise with pilot leads to organise visits to each site.

Regarding the action 2, Ram feels monthly meetings will not help because its likely pilot companies are going to attend these meetings without prior preparations and will simply say that they didn't have time, thus making the meetings redundant. Ram thinks onsite visits by Tamiris is a better strategy.

Elaine asked about using the on-site visits to gather data for the case studies, as it presents an opportunity for less intrusive data collection. This will allow the team insights into their markets etc. that would help us get a profile on the companies in a very casual way, without going in with a set of standardised questions as such. Ram noted that the case studies that are being prepared are documenting what we are doing with them and how the company is benefiting from REAMIT technology. Conducting interviews and performing additional data analysis is outside of the scope of the case studies being prepared by Usha.

Elaine suggests that we need to gather information that is pre and post REAMIT so we can see the challenges each company has faced and how the technologies have helped them reduce waste. We will need this information for our market readiness report. Tamiris requested Elaine send any questions to capture this data to her and she will try to ask them during her visits. Elaine said that Trevor has sent her a template for collecting data for case studies and she also has her own template that she has previously used. Elaine will condense both of these into something manageable and send it through. Elaine notes that some of the

questions may be answered through secondary sources or a separate visit if required, so that we are not asking too much of Tamiris.

**Action: Elaine to send questions to Tamiris to capture qualitative data for the case studies / MRL report during her on-site visits.**

Kate proposes that since Sasha needs to visit companies to capture photos and videos, we could try to coordinate the visits so that companies are not overwhelmed with REAMIT researchers coming at various times.

Kate proposes that we start internal update meetings once a month for each pilot company as there are many actions and taking points for each study, in order to provide a clearer understanding and overview. The meetings would be open to any partners interested in joining / contributing to that particular pilot test. Ram thinks that this is a good idea.

**Action: Organise monthly meetings for each pilot test.**

**WP T3 Activity 1: Risk, technology and sustainability assessments of REAMIT technologies (led by UCD with support from NTU, UU and BED)**

**D3.1.1: An assessment report of REAMIT technologies including a comprehensive systematic review.**

Tamiris has been working on a paper on Sensor technology to reduce food waste and its potential applications to support dynamic LCA. Tamiris presented the search methodology used to screen papers for the systematic review. The paper is divided into three sections; Xavier is writing the section on sensors, James is writing the section on business landscape, and Tamiris is writing the section on dynamic inventory. Tamiris has already completed her section of the paper. Ram asked what dynamic LCA is. Tamiris explained it is when different parameters are assessed in real time, for example using sensor data for LCA.

**Action: examine the whitepaper prepared by Ulster and see what could be used for the systematic review.**

Currently Xavier is examining the sensors used in the papers selected for systematic review and focusing on these. However, he said he will try to merge the information from the whitepaper into the review if he can. Tamiris wants to include the technical data about the sensors; to this end the whitepaper may provide some of the required information as it lists technical data on many popular sensors on the market at present. Xavier aims to have his section completed by the end of February.

Elaine asked the purpose of this paper – is it for a journal or for the deliverable? Tamiris said primarily a journal but it will also be used for the deliverable. Elaine mentions that to get through journal reviews, you need to have a rigorous framework in place for the selection and screening of articles. You need to mention the time span searched and how the papers were selected. Tamiris said they selected papers published in the last 20 years. Elaine said she will send Tamiris resources to add rigour to the methodology if required.

**Action: Elaine to send Tamiris information on literature review methodology.**

**D3.1.2: The life cycle assessment system will allow environmental impact data to be integration with REAMIT IoT sensor and big data solutions.**

Tamiris had a meeting with Yumchop (21<sup>st</sup> Jan) and Usha was able to collect some qualitative information and clarified some questions. Tamiris agreed with Yumchop to focus on their main products, rice and chicken. Abi (Yumchop) agreed to send the completed questionnaire to Tamiris by 29<sup>th</sup> January but she hasn't had time to complete it yet. Tamiris has sent a reminder but has not received any information so far. Tamiris simplified the questions as much as possible as suggested by Ram. A 2-3 day visit is now being planned to collect the data to improve both LCA and case studies. Tamiris is hoping to perform this visit by the end of this month but is waiting for Abi's confirmation.

Question: UCD only have €500 in their travel budget for WPT3; can we use travel budget from another WP for the LCA activities? Kate confirmed that the travel budget is cumulative between all the work packages, so as long as you are under the total of the budget line (travel and accommodation) there won't be any problems. If you are over the total budget line, we can also fix this but there are some rules from the funder. Kate said if Tamiris has any questions to send her an email.

Tamiris wrote an email to Imke, asking for details of number of sensors, type, and supplier used in the yumchop trial, and if Whysor could send her a sample sensor. This information is part of the pilot's life cycle and is necessary to estimate the impacts of the sensors' production. The idea is to open the sensor and weigh each component, metal, plastic etc. Tamiris has not received a reply from Whysor yet so James offered to send a similar sensor to Tamiris which got broken during the WD meats trial. Tamiris has now received the sensor from James. Tamiris is to check with Imke to ensure it is comparable with the sensors installed at Yumchop.

On 7<sup>th</sup> Feb the LCA software was installed onto the new computer Tamiris has been given for LCA simulations. At the moment, Tamiris does not have access to the Ecoinvent database. She is currently quoting the database extension.

Ram: regarding the sensor, Imke is not producing a specific sensor, so we should be able to just look at a 'typical sensor' available on the market. Tamiris said yes we can make some assumptions and say the sensors are similar / comparable. Ram said you can also check the sensors when you are on site at Yumchop.

Tamiris plans to start the LCA study on WD meats in March, Picnic in May, and so on up until May 2023. She has allocated 2 months for each LCA study. Tamiris intends to prepare a specific questionnaire for each company, which will be sent to the pilot leader. The pilot leader will send it to the company with a brief explanation of the purpose of the study. If the company has any questions or concerns, a meeting with the LCA team will be scheduled. Then, if data collection is considered time-consuming or complex by the company, a member of the LCA team will personally collect the information. In the meantime, Tamiris is planning the data collection of the big data server. She has contacted WPT2 partners this month to collect information regarding the server.

Ram: your approach is fine. You can send the questionnaire to the pilot lead and company, and if you think you will get better results by visiting them you can certainly visit them. Ram proposes that Tamiris visits the university of Bedfordshire during her visit to Yumchop as they are very close to each other. This will allow Tamiris to collect any specific data she needs related to the big data server. We will arrange with Sahar and Joy on this.

### **WPT3 Activity 2: Future-proofing REAMIT technologies (led by UCD with support from BED)**

James noted to the group that taking the extension into account, this deliverable is due in **July 2022**, meaning it is the first of the WPT3 activities due to be completed. James asked Ram if there was any flexibility on this as the report has not been started yet. Ram said that since the reporting periods are June and December, we can probably take until December 2022 to complete if required, however we should aim to have it completed before then.

Tamiris said that UCD has a budget of €20,000 for external Market Research and to process consumer feedback data. Tamiris suggests we could use this budget to help spread the surveys to consumers etc. Ram checked the budget and said Tamiris is perfectly entitled to use this budget for this idea.

**Action for Tamiris: Organise meeting with Yan to discuss questionnaire development with UCD. Include Usha in this meeting.**

James can organise this meeting if required. Yan said once she has the questionnaire ready she can share with the relevant people and then we can decide if we need to meet / when. James asked Yan when she plans to have the questionnaire finished. Yan said within the next 1-2 weeks. She suggests we can organise a meeting 3 weeks from now, and make it a wider meeting with Usha to discuss qualitative questions as well.

**Action for James: Organise qualitative meeting between Usha / NTU and Elaine / UU.**

James has sent an email to the relevant partners to organise this meeting, hopefully in the next couple of weeks.

### **WPT3 Activity 3: Market assessment (led by UU with support from BED, Valorial, I&R & NTU)**

Elaine had previously prepared a template for this report and shared it with the Ulster group. James has started to develop the base structure of the report based on the template outline that Elaine provided. As part of the template, Elaine suggested that we create an Osterwalder Canvas for each pilot. James has started developing an Osterwalder Canvas for WD meats for this report, however he said that the information for the canvas' are largely going to come from performing interviews / qualitative data collection / case study work with companies. Elaine confirmed that the canvas is a framework used to capture data which is linked to case studies.

Elaine is happy with where we are with this deliverable at present and UU have a very good idea of the data that we need at this stage and it is a matter of collecting this through case studies, for example.

### **WPT3 Activity 4: Development of a business case (led by UU with support from BED, Valorial, I&R & NTU)**

No updates since this WP is mostly a cumulation of most of the other REAMIT project outputs.



## Annex 7 Letters and testimonials from organisations outside the REAMIT project



A letter of appreciation from Dayananda Sagar College of Engineering to Dr Prof. Ram Ramakrishnan for his presentation at the conference “Applications of Artificial Intelligence and Computational Mathematics” (7-9/12/2020)



**DAYANANDA SAGAR COLLEGE OF ENGINEERING**

Accredited by National Assessment & Accreditation Council (NAAC) with 'A' Grade  
(*AICTE Approved, an Autonomous Institute Affiliated to VTU, Belagavi*)  
Shavige Malleshwara Hills, Kumaraswamy Layout, Bengaluru-560078

To,  
**Dr. Prof. Ram Ramanathan**  
Professor,  
Operations Management and Director of BMRI,  
University of Bedfordshire, UK

Bangalore,  
15<sup>th</sup> December, 2020

Please accept our sincere appreciation for the outstanding presentation you made to the International Conference on **"Applications of Artificial Intelligence and Computational Mathematics"** at Dayananda Sagar College of Engineering, Bengaluru from 7<sup>th</sup>-9<sup>th</sup> December 2020. The title of your talk **"Discovering potentials of Artificial Intelligence in fighting against food waste"** was very apt and inspirational to budding Engineers, faculty members and research scholars across the globe. Judging from the comments of those who attended, the conference was very successful.

As we are entering into digital era of Artificial Intelligence and computational Mathematics, I believe the researchers can benefit immensely from the methods you suggested for implementation of applications of A.I.

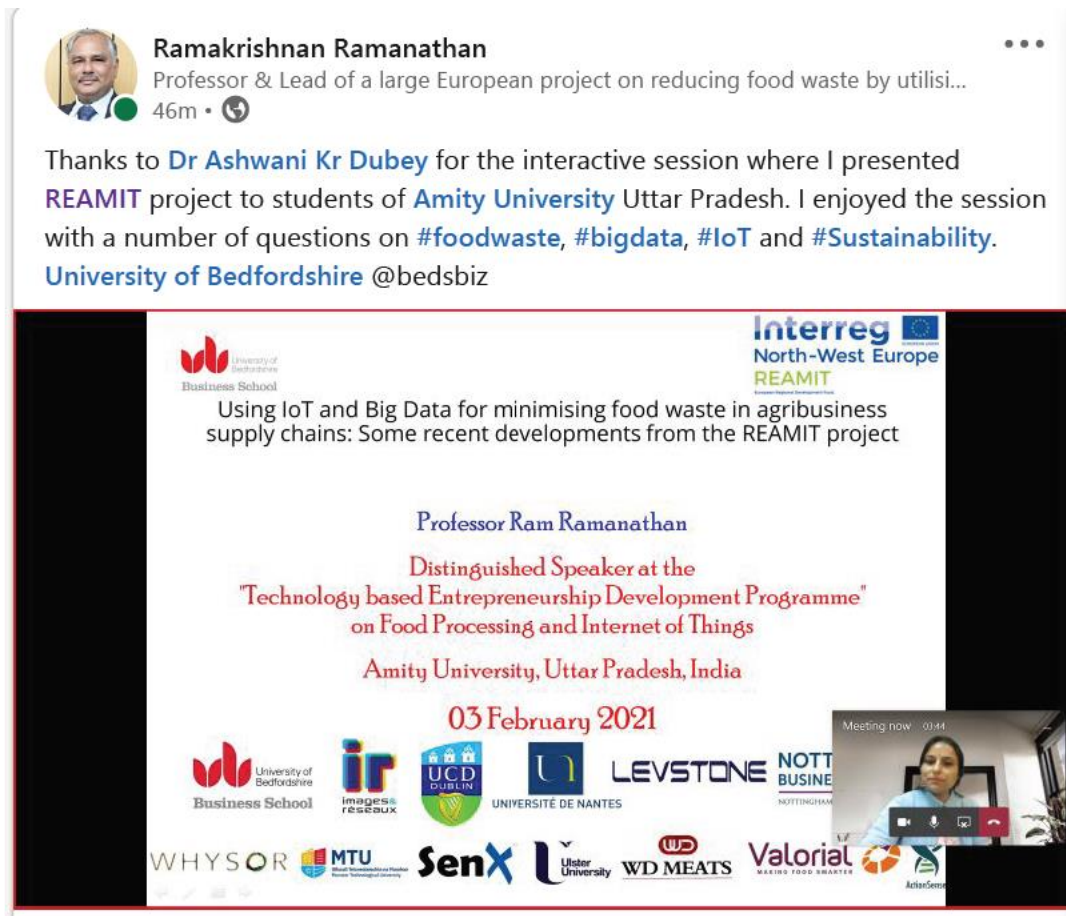
We are grateful for the time and effort you took to share your thoughts and experiences with the Conference participants.

Your enthusiasm is contagious, and we hope to use your suggestions in our research activities. Thank you again for your contribution.

**Dr. Radha Gupta**

Professor and Head  
Mathematics, DCSE

## A post in LinkedIn after Professor Ram Ramanathan's presentation at Amity University, India on 3/02/2021.



## A comment below prof. Ram Ramakrishnan's post on LinkedIn

Most relevant ▼



**Dr Ashwani Kr Dubey** • 1st

3m ...

Associate Professor at Amity University, Noida, UP, India Organizing Chair...

Thank you so much Prof. Ramakrishnan for your wonderful presentation. It was indeed a good session. We have enjoyed and learned a lot from your session. We have noted your moto that "Saving a waste for the best" and a quote "Use the power of bigdata for social cause". You are implementing a good research project which has a direct impact onto the society. We wish you all the very best for the success of the project REAMIT.

Best Regards

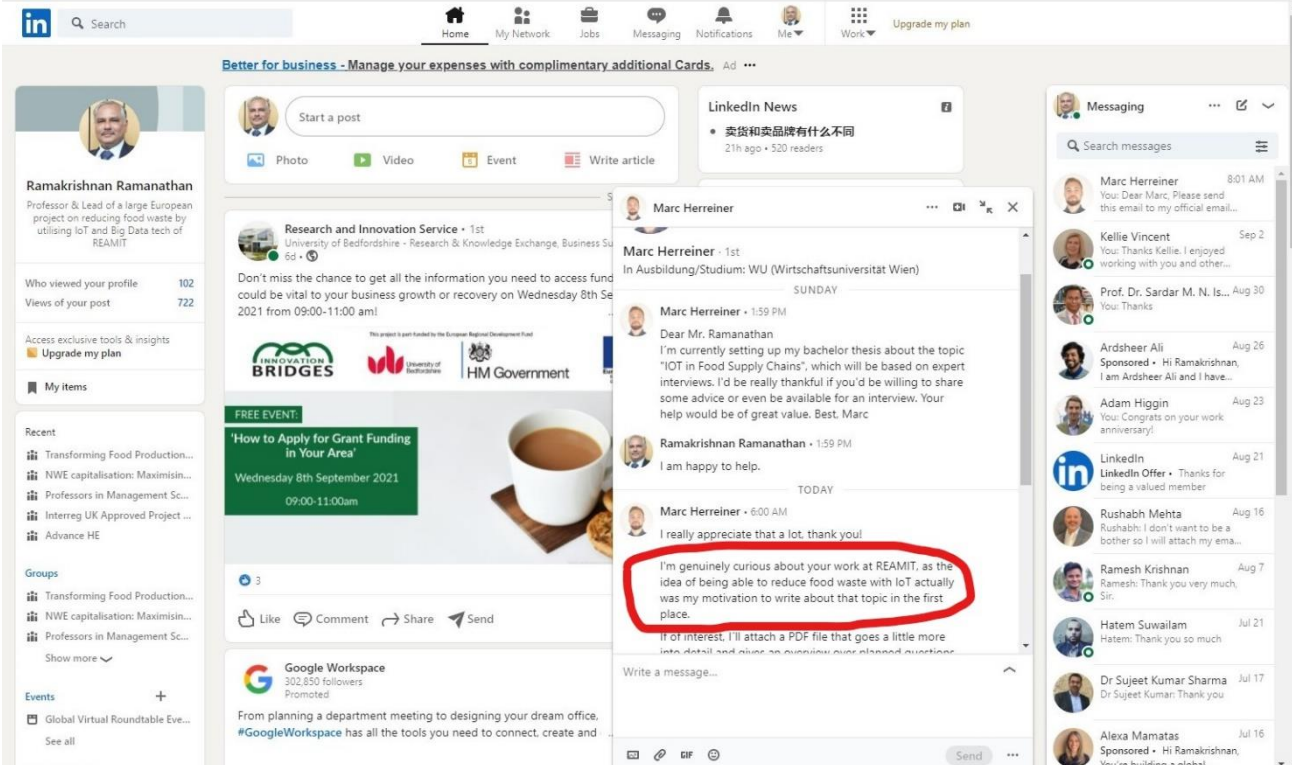
Like · 1 | Reply



Add a reply...



## REAMIT project is inspiring new academic aspirations (September 2021).



The screenshot shows a LinkedIn profile for Ramakrishnan Ramanathan, a Professor & Lead of a large European project on reducing food waste by utilising IoT and Big Data tech of REAMIT. The profile includes statistics: 102 who viewed the profile and 722 views of the post. It also lists recent groups and events.

A direct message conversation is open with Marc Herreiner. The messages are as follows:

- Marc Herreiner (1st): In Ausbildung/Studium: WU (Wirtschaftsuniversität Wien)
- Marc Herreiner (1:59 PM): Dear Mr. Ramanathan I'm currently setting up my bachelor thesis about the topic "IoT in Food Supply Chains", which will be based on expert interviews. I'd be really thankful if you'd be willing to share some advice or even be available for an interview. Your help would be of great value. Best, Marc
- Ramakrishnan Ramanathan (1:59 PM): I am happy to help.
- Marc Herreiner (6:00 AM): I really appreciate that a lot, thank you!
- Marc Herreiner (6:00 AM): I'm genuinely curious about your work at REAMIT, as the idea of being able to reduce food waste with IoT actually was my motivation to write about that topic in the first place.
- Marc Herreiner (6:00 AM): If of interest, I'll attach a PDF file that goes a little more into detail and gives an overview over planned questions.

The message "I'm genuinely curious about your work at REAMIT, as the idea of being able to reduce food waste with IoT actually was my motivation to write about that topic in the first place." is highlighted with a red circle.



## Annex 8. Events where REAMIT partners promoted the REAMIT project.

1. UCD partners promoted REAMIT at 'The School of Biosystems & Food Engineering Research Day Seminar', UCD, Ireland. The event was organised by the School of Biosystems & Food Engineering, UCD, Ireland, 11<sup>th</sup> of March 2020.
2. UCD partners promoted REAMIT at 'Research Seminar for the Department of Agricultural and Biological Engineering', Department of Agricultural and Biological Engineering, Penn State University, USA, On 24<sup>th</sup> of March 2020.
3. UCD partners promoted REAMIT at 'Institute of Food and Health Research Day 2020', UCD Institute of Food and Health, UCD, Ireland, 15 October 2020.
4. March 2021, Future of Food event, Pat Doody, MTU, invited to present REAMIT.
5. 2nd International Conference in the field of Climate Change Impact on 25th & 26th May 2021, Kuala Lumpur, Malaysia, Ram Ramanathan has been invited to present the REAMIT project.

### 1/01/2021 – 30/06/2021

1. NTU attended Sustainable Food & Food Security Symposium held online at NTU.
2. BED made presentation for EurOMA conference (July 2021). The outcome from this research was presented at invited lecture to a webinar series organised by Operations Research Society of India (ORSI), 12/06/2021.
3. RR presented REAMIT at Internet of Food Things Network, Lunch Talk, 22/01/2021.
4. KP attended Innovate UK 'Food Industry Innovation 2021' online event, 3-4/03/2021.
5. KP prepared presentation of REAMIT for "International Webinar on Business-Management 2021", 30/03/2021; theme was "Start a day with new business strategy". Presentation focused on aligning technology strategy in organisations for competitive advantage in businesses.
6. RR and KP attended NWE impact event 'Greener NWE networking event' organised by Interreg NWE Programme, 20/05/2021; RR facilitated round table session on achievements of REAMIT and synergies with other NWE projects focused on resource efficiency.
7. YD made online presentation of REAMIT at International Conference on Intelligent Agriculture (ICIA2021), Tianjin, China, 20-22/05/2021.
8. RR was keynote speaker at 2nd International Conference on Climate Change Impact on 25-26/05/2021, Kuala Lumpur, Malaysia.
9. RR and LM made presentation inspired by REAMIT (12/06/2021) on 'The application of IoT and Big Data technologies to reduce food waste in Europe' at Operations Research Society of India (ORSI).
10. MTU presented REAMIT at Enterprise Ireland Technology Gateways conference, 18/03/2021.

**1/07/2021 – 31/12/2021**

Staff from BED presented and represented the REAMIT project at 8 external events focusing on ICT, food supply chains, agri-food production and business strategies:

1. LM and RR presented REAMIT at EurOMA21 Conference, 7 – 8 July 2021.
2. LM presented REAMIT at Indian Institute of Plantation Management, 26 – 30/07/2021.
3. KP represented REAMIT project at 'Make UK: Meet the Buyer. Food and Drink Supply Chain, 5/10/2021.
4. SA presented REAMIT to supply chain master class students at BED, 11/10/2021.
5. KP presented REAMIT at online meeting of Trust & Trace Network, Germany, 13/12/2021.
6. TA presented REAMIT at 19th Annual World Food Innovate Virtual Summit, 18 – 19 October 2021.
7. KP represented REAMIT at Transforming Food Production: Series A Investor Partnership event, 19/10/2021.
8. TA presented REAMIT at International Conference on Innovative Research in Science and Technology, 26 – 27 November 2021.