REAMIT

OPEN CHALLENGE CALL

INFORMATION GUIDE

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1 Introduction to the Interreg REAMIT project

Food waste is a serious problem in the EU. Nearly 88 million tonnes of food, equivalent to €3 billion, are wasted every year in the EU. The Union has pledged halving the food waste by the year 2025. Reducing food waste not only increases food availability but has more benefits in the form of saving significant food production resources (water, energy, labour, fertilisers, etc.).

It has been estimated that around 35% of food waste occurs when the food travels across the supply chains. In the **REAMIT** project, we are passionate in reducing food waste along agribusiness supply chains. REAMIT stands for "Improving Resources Efficiency of Agribusiness supply chains by Minimizing waste using Internet of Things sensors". This project will focus on fresh food (fruits/vegetables/meat and fish) and aims to reduce waste of these foods in the following ways:

1. Tracking the quality of fresh food using sensors. Both traditional sensors (temperature, humidity, light, vibrations, etc.) and newer sensors (e.g., Raman spectroscopy and 3D Fluorescence spectroscopy).
2. Collecting data from sensors in the cloud and monitoring the data using automated big data technologies.
3. Contacting food owners (using smart phone Apps) as early as possible in the case of any potential loss of food quality, providing suggestions for saving the food before it becomes waste.
4. Conducting big data analytics on the sensor data to bring out long term strategies for reducing food waste in NWE in the long run.

The REAMIT Consortium is being led by the University of Bedfordshire (UK) with more organisations in North West Europe (NWE) with expertise in transporting fresh food in the agri-supply chain, sensors, big data collection and data analytics.

We will share the data on food quality only with the owners of the food and will not share with any other parties. For data analytics purposes, only aggregated information will be made available for public consumption and no information specific to any company will be made available.

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2 General information about REAMIT technical solution provided

You will be a company dealing with transportation and/or storage of fresh food, willing to use sensors to track quality of the food and share the data to help reduce food waste in NWE region. We will work with you in identifying best ways of fitting sensors and collecting the data.

Here is a brief overview of the solution the consortium may help you to use in order to implement your challenge.

2.1 Sensors

2.1.1 Raman spectroscopy

Our Raman sensor proposes a full integrated and completely automated system able to analyze the food sample directly in a refrigerated truck used for food transportation. The optical measurement is done by a contactless optical head and the system can be self-ruling or operated by a user. The generated data will be compared directly by the built-in database or sent to the control center for data analysis and exploration.

Non-invasive techniques such as Raman spectroscopy, based on the interaction of light with matter, offer a versatile method which allows the rapid characterization and observation with very high reliability. The resulting Raman spectrum offers an overall view very useful to understand the analyzed sample. One measurement of a few seconds is able to provide the molecular composition of the sample without any sampling or extraction allowing for example, the determination of its content in biological molecules (carbohydrates, proteins, and lipids) or the evaluation of the quality gap between the "normal food" and "waste". The distinctive traits can be related to the presence of microorganisms degrading the quality of food, the nutritive value is lost during processing and/or bad storage or other problems occurring during food transportation.

2.1.2 Cyberbar technology

Cyberbar technology allows food traceability using a novel food-grade data matrix technology. Tamper-proof food traceability is provided through direct imprinting of smartphone-readable data matrices onto food. Cyberbar is a novel labelling system based on the laser imprinting of data matrix imprint directly onto meat product such as a chicken breast fillets, prime beef cuts, etc using a novel food grade marking system. The resultant data matrix information can be readily interpreted using image analysis software typically found on smartphone devices, whilst overcoming the undesirable leaching effect. Using this technology, it affords the food processor, the retailer and the consumer the opportunity to access on-the-spot (real time) information on the food product thus offering a secure tamperproof food traceability systems for both local and global use.

This technology enables verifiable traceability in real time extending right down the food supply chain from the food processor to the consumer ensuring a robust integral chain of custody is achieved.

2.1.3   3D Fluorescence

Fluorescence spectroscopy is a type of electromagnetic spectroscopy that analyzes fluorescence from a sample. It involves using a beam of light, usually ultraviolet light, that excites the electrons in molecules of certain compounds and causes them to emit light; typically, but not necessarily, visible light

2.2   Big Data analytics

Big Data infrastructure will address REAMIT data requirements: (i) to compile data from sensors to a Big Data platform; (ii) to develop another platform for linking suppliers and consumers; and (iii) to analyse sensor data to understand the patterns of food waste, to identify "food at risk", and to provide decision support to food owners for making rapid decisions to save food. Food owners, truck drivers and warehouse managers will be connected using a dedicated Smartphone APP.

Different consortium partners bring their own value added in this perspective including 1) an Open Source data analytics framework including a (geo) data time series database and a data analytics engine for sensors data, 2) a end to end sensors data technology that goes from the data collection to the analytics, 3) business applications (including mobile app) in industry and logistics based analytics data technology and services for real time data.

The REAMIT consortium is keen to consider different kinds of collaboration to facilitate the integration of new sources of data in respect with specific commitments that could be requested regarding the protection of data.

2.3   Smartphone application

A new mobile app designed for transport drivers, warehouse operators, end-users, and supply chain management (food owners).

(1) Transport mode. The app seamlessly connects with truck REAMIT sensors via Wi-Fi and sends the sensor data to the cloud along with complementary metadata (journey destination, estimated arrival time, live GPS location, food type, customer id, vehicle id,…).

In the event the food quality is deteriorating the app will display a notification such as "High temperature Warning" (for the driver to check the refrigerating is working) or "Please change destination" (if the original destination is no longer suitable due to food deterioration then the driver will click 'confirm' and the app opens Sat-Nav for the new location.

(2) Receipt & Despatch mode (Warehouse and End-User). The app seamlessly connects with REAMIT sensors, lets the user to take phone camera photographs, and sends the data to the cloud.

(3) Management mode. The app displays REAMIT sensor data, real-time analytics alerts (relating to food deterioration) and lets a user make a decision to change the destination for a truck.

The app features highest level encryption, security, GDPR compliance, privacy, no external adverts or marketers – all data goes direct to the REAMIT big data platform.

2.4   Google-based web portal for collecting data on food demand points in REAMIT corridors (via self enrol)

A REAMIT database will be created in conjunction with web-portal tools to allow food owners to create and administer agri-food supply chain food parameters for the project.

Example:

'food type' there will be an array of sensor set-points that can trigger low and high level alerts to indicate food deterioration.

'journey corridors' that will comprise a minimum of two geo-location points for departure and arrival, and the ability to support interim journey stops.

'food consumption places' that defines an organisation interested in receiving various 'food types' at short notice with a potential cost/food quality matrix.

The idea is for food owners and food consumption organisations, such as charities, to be able to register and self-administer their data. It allows Food Owners to choose an optimum organisation in the event food quality is deteriorating and needs to be re-routed.

A longer term objective could be to create a secure supply-demand model that facilitates the destination re-assignment of diverted perishable food goods.

3   General information about the Open Challenge

The main aim of the REAMIT open challenge call is to reach organisations engaged in transporting fresh food (fruits, vegetables, fish and/or meat) for fitting sensors and tracking the quality of the food. The data from sensors will be monitored and owners of food will be reached as soon as possible to warn of potential quality loss. Decision support will be provided on how best to sell the food locally in order to maximize revenue and reduce food waste. These efforts will not only support the social cause of reducing food waste in the EU but will also help improve revenues for the participating organisations.

3.1   Who can participate?

We are seeking to reach organisations involved in transporting fresh food (fruits, vegetables, fish and/or meat) in North West Europe ([http://www.nweurope.eu/about-the-programme/the-nwe-area/)](http://www.nweurope.eu/about-the-programme/the-nwe-area/). We term such organisations as the End-Users of the project. We are specifically looking for end-users in the five countries (the UK, the Netherlands, Germany, Ireland and France) in which REAMIT project has partners.

The REAMIT consortium has some funds to fit sensors in their trucks and warehouses. The data will then be sent to the Big Data Hub in the University of Bedfordshire for continuous monitoring. We term these activities as Pilot Tests.

The data will be kept securely and will not be shared with third parties. Data analysis will be done only on anonymized aggregated data.

3.2   What are the benefits of participating in REAMIT pilot tests?

The REAMIT consortium has expertise in reducing food waste, sensors, fitting them, collecting data to the Big Data platform at the University of Bedfordshire, and conducting detailed data analytics on the data for reducing food waste. By participating in the pilot tests, you benefit from the wide expertise in the future-proof technological developments.

Participating end-users will see an improvement in their bottom-line as there is a new revenue stream from food that would otherwise become waste. Further, since reducing food waste not only increases food availability but has more benefits in the form of saving significant food production resources (water, energy, labour, fertilisers, etc.), there are social benefits too. Thus, by participating in the REAMIT initiative, you will benefit by reduced 'food owners' carbon footprint and making you more socially responsible. The REAMIT project will quantify the carbon savings you will make by reducing food waste, and highlight the potential improvement to your carbon footprint. Thus, you will be able to highlight your contribution to reducing greenhouse gas emissions in line with EU 2030 targets and your association with a 'green' project that strives to save valuable resources in Europe.

The participating end-users will further benefit from the wider network of organisations linked to the theme of REAMIT, access to the findings of the project team on causes of food waste based on data analytics, and with media opportunities. They will be able participate in annual REAMIT Networking events.

3.3 Challenge duration and calendar

This Open Challenge Call will close in June 2022. We request all interested end-user organisations to send their information as per the attached template before June 2022. The information will be reviewed by the REAMIT consortium regularly and promising end-users will be approached for a preliminary analysis. This will be done within 2 months of receiving relevant information from you.

If found suitable, sensors will be fitted ready for sending the data to the Big Data Hub in 3-4 months. The consortium has limited funds for fitting sensors. Traditional sensors (temperature/humidity/lighting/vibration, etc.) will be fitted depending on the assessment by the project team. More advanced sensors, such as Raman Spectroscopy and 3D Fluroescence, will also be fitted if found suitable. Once fitted, the sensors will keep sending data on food quality until the end of the project (July 2023) and beyond. The REAMIT consortium, led by the University of Bedfordshire (UK), will develop automated algorithms so that monitoring/analysing data and sending alerts to owners will continue even after the end of the project.

4   How to prepare and submit the proposal?

If you wish to participate in REAMIT pilot tests, please send us some description about yourself as per the following questions. Please ensure that you do not exceed 2 pages in total.

1. Your name and the name of your organisation.
2. Experience and current activities of your organisation.
3. Your expectation on the use of sensors in your organisation for tracking food quality
4. Any other relevant information.

This description may be submitted in English or in any of the four languages of the participating countries (NL, DE, FR).   Please send the details to the email address (openchallenge@reamit.eu) . Please also add any other document you feel relevant in your email or while you are uploading.

We will send you confirmation of receipt of your application within 2 days.

If you have any queries, please contact the lead partner (ram.ramanathan@beds.ac.uk) or send an email to the open call email (openchallenge@reamit.eu). We will respond to your queries as soon as we can.

5   Implementation of the challenge

If the REAMIT consortium decides to include your organization for pilot tests, our in-country experts will guide you in terms of fitting sensors and connecting to the Big Data Hub in the University of Bedfordshire. All information sharing will be transparent, giving you full information of the pilot test. We will consult you in preparing progress report every 3 months. You will be expected to share the experience of your pilot test and further feedback with the project team regularly, and also at annual REAMIT networking events.

6   Confidentiality, Partnership

The expression of interest will be strictly confidential. We will enter a confidentiality agreement prior to starting pilot tests. The REAMIT consortium will follow the standard ethical principles (governed by the University of Bedfordshire and by professional associations such as the British Academy of Management) for ensuring your data is kept securely and ethically.

7   The REAMIT Consortium

University of Bedfordshire	The University of Bedfordshire is the lead partner of the REAMIT project. They have expertise in making business sense of big data and internet of things technologies, applied to agriculture, aquaculture and other sectors.
images & réseaux	Images et Réseaux is an ICT Cluster in western France , and we are focused on cores digital technologies (5G & next generation infrastructures, big data and AI, immersive & interactive content, cyber physical system, digital trust, and photonics) in 5 sectors (health, agriculture & farming, digital fab & services, digital territory, and digital entertainment) https://www.images-et-reseaux.com/
UCD DUBLIN	University College Dublin (UCD) is Ireland's premier university, with over 24,000 students and a research budget in excess of €100 million per annum. The UCD members have expertise in food engineering, have developed IoT based sensors (e.g., the CyberBar system) and lead life cycle assessment modelling for the analysis of environmental impacts of a range of production systems.
UNIVERSITÉ DE NANTES / GEPEA	The GEPEA laboratory of University of Nantes participates mainly in the development of optical sensor for REAMIT project. The laboratory has solid scientific skills in optical biosensors applied to food and environmental fields. https://www.gepea.fr/
LEVSTONE	Levstone Ltd a software house specialising in high-security, cutting edge mobile software and cloud big data solutions. Levstone are winners of InnovateUK (Gov) research projects. Our solutions are used in logistics, transportation, and health and social care for vulnerable citizens. We focus on real-time data acquisition (inc. IoT sensors), data privacy and ensuring data authenticity.
NOTTINGHAM TRENT UNIVERSITY	Nottingham Trent University is one of the leading higher education institutions in East Midlands, UK. We are liaising with local businesses for our curriculum enrichment and practice-based education. Our primary activities in this REAMIT project are dissemination of results to wider community and communication to internal & external stakeholders through various media. We will also be involved in implementation of IoT technology in agri-food supply chains of local food businesses.
WHYSOR	Whysor's main activities are in the Internet of Things and Big Data area. They connect IoT devices to the cloud, by providing a long-range (LoRa) infrastructure for the Internet of Things. For the REAMIT project, Whysor will work with pilot tests in all five countries to collect data from sensors and put them in the cloud and also work on analytics along with other partners. Next to being a broker we will be providing dashboarding functionality to view the gathered data in realtime as well as the ability to generate alerts based on that data.
INSTITUTE OF TECHNOLOGY TRALEE	The IMaR Research Centre, based in Institute of Technology Tralee, has at its core expertise in electronic and mechanical hardware, software, IoT and data analytics. This expertise is applied across a large range of verticals including manufacturing, agriculture and food sectors. IMaR has previously developed sensor platforms for environmental monitoring and analysis in the food supply chain through their involvement in the Life+ funded Freshbox project. www.imar.ie
SenX	SenX is the software developer and publisher of Warp 10, an Open Source solution to manage and to analyze data from sensors / IoT. Warp 10 is

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	based on a Geo Time Series technology and propose a Time Series database and a library og more than 900 data analytics functions in an horizontal, performant, neutral, secured and industrial perspective.
Ulster University	The University of Ulster is a partner of the REAMIT project. They have expertise in sourcing and developing sensors as well as intelligently analysing data from sensors with applications in agriculture, health, tourism and other sectors
dunbia	Dunbia (Northern Ireland) is a processor red meat situated in Co Tyrone NI with locations throughout the UK. With annual processing of 60,000 cattle and 200,000 lambs, the Dungannon based facility performs slaughter, deboning and retail packing of meat products at its sites. Combined with externally purchased products its annual turnover of £220m includes markets across the UK (retailers) and export (Europe and Asia), serving markets with carcase, primal and retail packed products. In the REAMIT project, Dunbia will be one of the end-users. They will provide access for fitting sensors that track quality of raw meat in trucks and food processing warehouses to facilitate data download from sensors for further analysis to eventually reduce food waste.

8 Contact

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          https://www.linkedin.com/company/reamit/