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Interreg North-West Europe REAMIT

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POLICY DEVELOPMENT OF AGRI-FOOD BUSINESSES IN UK AND NORTH-WEST EUROPE

REAMIT POLICY SUPPORT DOCUMENT

This document should be read in conjunction with the document published by Parliament Committee, UK
https://committees.parliament.uk/writtenevidence/114215/pdf/

REAMIT support document in relation to develop food-policy across UK and North-West Europe

Written evidence document to support policy development from REAMIT project was developed by the University of Essex and published in the https://committees.parliament.uk/writtenevidence/114215/pdf/. We present this additional document to give an overview of use of the suggested policies in real settings with suitable examples from the REAMIT project and other Interreg projects. The ambition of this document is to assist and support the UK and European policy makers and actors who are responsible for shaping the future policy of agri-food supply chains such as European Commission, Member States and UK's national authorities (ministries developing policy proposals) to reduce food waste.

Introduction

Reduction of food waste is of high importance globally, with member nations working towards UN Sustainable Development Goal 12.3 which is focused on halving food waste by 2030 [www. fao.org]. In the EU, over one third of food waste (35%) occurs within the supply chain [https://www.reamit.eu/overview]. Food waste has vast economic, environmental, and social impacts; therefore, it is vital that all stakeholders within the food supply chain can monitor food quality and participate within the reduction of food waste.

The collection and use of data within supply chains allows for the development of responsible and measurable business practises, enhancing both efficiency and sustainability. A data driven agri-food supply chain can lead to improvements not just in the safety of our food supply, but also help to reduce food waste. In this technological era, Internet of Things (IoT) sensors can be used in food supply chains to monitor food quality parameters and store the data in the cloud. Other technologies such as cloud computing and Big Data analytics can be employed to derive insights from the data that can save food from becoming waste. By using data collected from sensors (which can include environmental monitoring e.g., temperature and humidity, and location tracking), increased sustainability of food supply chains through reduction of waste and associated GHGs can be achieved. The monitoring of food quality through IoT sensors also enhances food safety and facilitates the compliance of food businesses to food standards legislations. Using data from IoT devices and analytics, food companies can develop data-driven decision strategies aimed at preventing food waste in their supply chains.

The REAMIT (Improving **R**esource **E**fficiency of **A**gribusiness supply chains by **M**inimising waste using Big Data and **I**nternet of **T**hings sensors) project (www.reamit.eu) is using IoT sensors and data-driven decision support systems to assist food supply chains in real time within Northwest Europe. The project is funded by Funded by EU Cohesion Policy, Interreg North-West Europe Programme 2014-2020. This policy documents outlines the possible policy development that could be adopted by local councils, food businesses and all stakeholders, considering the current technology advancement and use of technology in food supply chains.

Policy for food producers and manufacturers

- **Optimised storage conditions supported by IoT devices and alert systems.** Environmental monitoring could be implemented for automated hazard analysis and critical control points (HACCP); this would aid food businesses to abide by strict food standards regulations whilst also avoiding spoilage. Both food producers and manufacturers could install low-cost temperature sensors within ambient, chilled, and frozen storage areas, with data from devices being used to send alerts when risk of spoilage is increased. For example, Yumchop Foods, a frozen ready meal manufacturer who distribute their product via vending machine with inbuilt freezers. The company maintains the temperature threshold of -18 degree Celsius in their cold storage, in line with the legal requirement of food quality [Ramanathan et al., 2022]. Yumchop Foods use IoT temperature sensors combined with cloud-based data analytics successfully to send SMS alerts. The alerts notify the company of any temperature fluctuations that could damage product integrity. Before having IoT sensors installs, Yumchop practiced manual monitoring of freezer temperatures twice a day. For food producers, optimised storage conditions in warehouses and abattoirs will preserve food conditions alongside food safety. REAMIT partner and food producer Burns Farm Meats, found that through the use of IoT temperature and humidity monitoring, anomalies detected in dry ageing chambers within their abattoir reduced spoilage and allowed staff to correct any issues promptly (www.nweurope.eu). Food manufacturers and produces can maintain specific temperature threshold for variety of products with continuous monitoring of temperature through IoT sensors. This will need to be made into regular practices of all food manufacturers to be certified as ethical, safe and quality food businesses. (https://www.mdpi.com/2071-1050/14/24/16614)

- **Sourcing.** Collaboration and partnership between producers and manufacturers should be encouraged. Manufacturers could work closely with producers including crop planning and/or whole crop purchase (Government Office for Science, 2017), as exemplified by REAMIT partner Biogros who work cooperatively with regional producers and organic fair-trade suppliers (https://www.biogros.lu/en/about). An increase in the use of seasonal produce alongside sustainable supply chains for long life products (such as rice, tea etc.) will have beneficial impacts on both the environment and society. Ethical sourcing from the businesses who follow regulatory conditions on quality of food will encourage the whole supply chain to maintain the same standard throughout the supply chain. Use of the IoT sensors will help to assure the quality, as long as there is a strong collaboration between suppliers and the rest of the supply chain members.

- **Diversification and redistribution schemes.** To reduce the social implications of waste, both producers and manufacturers can sign up to distribution schemes such as FareShare or similar local initiatives (food banks and social eating spaces) alongside consumer mobile applications e.g., Too Good to Go, which connect consumers with food that has short best before/expiry dates and can be collected directly by the customer. Food manufacturers can seek ways to create value from potential waste, for example turning over ripe or damaged fresh fruit and vegetables into higher value products such as jam, chutneys, soup or smoothies. Manufacturers can also make opportunity of local food networks and markets such as Neighbourfood, Open Food Network and The Food Assembly. Local councils and food vendors should be

encouraged to practice this redistribution to avoid waste and enhance the use of available food in the local area.

- **Data analytics for smart organisation and efficiency.** The application of data analytics within food manufacturing could lead to the optimisation of quality and quantity of food ingredients, particularly fresh food (Sharma et al., 2021). REAMIT data analytics team has come-up with a suggestion of introducing penalty cost in the optimization models. Using algorithm-based alerts, stock can be ordered based on demand and need rather than estimated. This can be combined with automated processes such as automated ordering when ingredient stock is low.

- **Optimised manufacturing and inventory conditions.** Manufacturers could seek to optimise their processes through the use of smart technology. Monitoring of environmental factors including temperature, humidity, and light (via Raman spectroscopy) is key for optimal storage conditions of ingredient and stock inventory. Alongside storage conditions, the use of automated machinery processes and IoT devices such as flow meters and smart valves for temperature during manufacturing can aid in monitoring hazards and food safety. The use of IoT devices and data analytics can also assist in predicting machinery maintenance and avoiding food wastage through unexpected manufacturing problems or equipment breakdowns (Jagtap et al., 2020).

- **Waste management and redistribution.** Work with local authorities and community food distribution networks e.g. FareShare for sharing of food surplus or waste suitable for human consumption, whilst non-consumable waste should be sent for other manufacturing processes, anaerobic digestion, composting or animal feed (as undertaken by REAMIT partner Biogros). Food manufacturers should be incentivised to collect food waste data in order to develop targeted waste minimisation plans. Manufacturers are also in positions to develop new products from potential waste and should be encouraged to find avenues to convert potential waste into by-products. The case of Biogros, Luxemburg based Food company, is an ideal example of using the fresh produce to maximum possible level with zero waste. A story telling approach within every council area will help educating the locals.

Policy for food distributors and retailers

- **Short supply chains, local food networks and seasonal eating.** Increased partnerships with local (within 150 miles) and national producers; improving local food production and promoting seasonal produce rather than importing some goods (mostly fresh meat, dairy, fruit and vegetables). Whole crop purchases by food retailers, including supermarkets, is encouraged, alongside a deeper involvement with farm crop planning to reduce farm gate waste. Advertising campaigns can help shift consumer purchases to seasonal eating, assisting in the reduction of GHG emissions from fewer food miles alongside a decrease in spoilage from transportation. REAMIT partner Yumchop [3] sources ingredients from retailers and producers within a 30-mile radius, whilst Biogros work closely and cooperatively with local farmers (https://www.nweurope.eu/media/18910/221108-biogros-poster-final.pdf). Whole crop purchases by supermarkets can be seen as a positive for farmers. This type of purchase reduces the risk of supermarkets not taking an amount of harvested crop for the variety of reasons

mentioned in the above comment (blemish, right size etc.) and guarantees the farmer their order. See ECR-Report-2020-v4.pdf (theconsumergoodsforum.com) page 10 and Farm_waste_report_.pdf (feedbackglobal.org) , page 10. This is guidance given by WRAP.

- **Enhanced traceability via IoT and transparent database solutions.** Both food distributors and retailers could benefit from improved operational efficiency via real time tracking and use of GPS/Radio Frequency Identification (RFID) to reduce lost consignments, financial costs, and GHG emissions of lost shipments. Future applications include the use of blockchain databases for enhanced traceability of products and consignments, alongside transparency of data throughout the supply chain, which could increase not just operational efficiency but can also be used as an opportunity for building consumer trust (https://www2.deloitte.com/us/en/pages/operations/articles/blockchain-supply-chain-innovation.html).

- **Optimised warehouse and logistics conditions.** Food distributors and retailers would benefit from the installation of IoT sensors connected to cloud data hubs for environmental monitoring within storage and logistics to reduce fresh, chilled, and frozen food spoilage. IoT sensors can be linked with a dashboard for real time monitoring and algorithm-based alerts. For example, Picnic, an online grocery store based in the Netherlands and serving 120 Dutch cities via 1000 electric vans, developed a data driven weather regime in collaboration with REAMIT to decide how many icepacks are used within their deliveries. REAMIT project also installed a number of sensors within Picnic's delivery cool boxes for anomaly detection, with alerts sent via SMS/email if temperature irregularities arose that would lead to food waste, allowing the company to step in before any food spoilage occurred (https://www.nweurope.eu/media/19113/221201-picnic-poster-draft-5.pdf). Therefore, the use of this technology could lead to a reduction in food waste alongside benefits for company (including financial and customer satisfaction) due to less food spoilage.

- **Use of IoT for real-time data driven decisions.** Real time data regarding stock inventory collected via IoT devices/smart sensors and analysed with Big Data techniques can be used for enhanced planning and identification of emerging trends. Retailers could employ such technology for improved reactions to stock fluctuations rather than planning forecasts based on historical data trends or estimates, allowing for both financial savings alongside reduction in waste throughout the supply chain.

Policy for local authorities

- **Localised and sustainable procurement policies.** Authorities could ensure investment and development of short supply chains; reducing food waste through contracting local producers and transport within a 10-30 mile radius for perishable food products. A focus on seasonal and local food within school, community, care home, and hospital meal menus can minimise food waste whilst also leading to opportunities such as Soil Association Food for Life awards (UK) (https://www.foodforlife.org.uk) and developing community wide healthy eating habits. Long-life shelf products can be procured from other sustainable food supply chains.

- **Development of local food networks.** Mapping activities of key food supply chain stakeholders within local authority boundaries may encourage the development of a local food network. Such a network could increase local food procurement, develop clear routes for redistribution of food surplus, and divert waste that is no longer suitable for human or animal consumption to other recycled organic waste management schemes e.g., community composting or biogas. This could also be linked with data analytics to support food distribution decision making. Every food business can start collecting data in a Big Data Hub and conducting analytics to develop algorithms supporting decision making on rerouting 'food soon-to become waste' to the nearest rather than planned consumer. (REAMIT Brochure Dec 2022, page 2)

- **Waste distribution and management schemes.** Incorporation of the food and drink waste hierarchy (https://www.gov.uk/government/publications/food-and-drink-waste-hierarchy-deal-with-surplus-and-waste) within policies to plan for food surplus and food waste minimisation. For redistribution of food surplus, support of food banks and social eating spaces should be prioritised. Household waste could be reduced via the support of local authorities for national food waste campaigns. In line with the Environment Act 2021, all UK councils will be legally required to implement weekly household separate food waste collection from 2023 (Environment Act 2021 (legislation.gov.uk)) for anaerobic digestion and composting, whilst the hospitality sector must also separate their food waste from general waste for separate collection.

- **Business incentivisation.** Work with hospitality and catering sector to collect better data on food surplus and waste to help enable businesses make better environmental and financial decisions. For enhanced food waste management and redistribution, businesses can be incentivised through a reduction in waste removal costs or penalisation for those that do not redistribute surplus unsold food (as seen in the EU [https://www.theguardian.com/world/2016/feb/04/french-law-forbids-food-waste-by-supermarkets; https://www.theguardian.com/world/2016/aug/03/italy-food-waste-law-donate-food) or funding for SMEs to support related activities. Authorities could also incentivise businesses through offering financial and/or technical support for the installation of low cost IoT devices for monitoring food quality or sustainable packaging development. Such initiatives would also assist in working towards better environmental health and food safety across local authorities. These activities could be undertaken with the support of the research/higher education sector or public bodies e.g., Food Standards Agency.

- **Use simple IoT technology in perishable food supply chains.** The installation of IoT devices within local authority food supply including food storage areas (such as canteen refrigerators) could be investigated to determine the potential of improving efficiency, reducing food waste, and making financial savings.

Summary

This document has highlighted various options of reducing waste and hence to create green food supply chains, using technology adoption. A number of the policies recommended have emerged directly from REAMIT activities such as the use of alerts sent by IoT monitoring devices linked to cloud. Ideas generated but not used within REAMIT include future technology adoption such blockchain, and smart manufacturing technology such as flow meters. A rapid response from all stakeholders of food supply chains including policy makers can help creating sustainable food supply chains in the UK and Europe. IoT sensors and Big Data analytics can be considered as the future of all supply chains to envisage a clean carbon free, waste free and healthy food for all future.

There are very good opportunities for influencing policy on food waste reduction based on lessons learnt from REAMIT, and policy proposal based on lessons learnt can be formulated to reach wider stakeholders of food industry. To start with we can introduce the following two policies with immediate effect: 1. Obligatory monitoring of conditions in which food is stored. 2. Manual temperature recording needs to be automated to have continuous monitoring.

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