

Written evidence submitted by the REAMIT project and the University of Essex

The REAMIT project (REAMIT, 2022) is a trans-European project funded by the Interreg North-West Europe working on the use of modern digital technologies for reducing food waste in food supply chains (www.reamit.eu). Professor Ram Ramanathan, currently a professor in Essex Business School, is the lead of the project. The project consortium consists of 6 universities and more businesses in the UK, Ireland, France and the Netherlands.

Food waste is a global problem. Food Strategy of the UK Government and the strategy on waste highlights that waste is harmful not only for the environment but also for businesses and for the society. Food waste can be avoided using relatively inexpensive strategies. While there are efforts in various parts of the UK in reducing food waste, the promises of modern digital technologies (Internet of Things sensors, big data, cloud computing, and analytics) have not been adequately utilised towards this cause. Based on our research, we feel that there are useful policy options to help improve the use of technology in our fight against food waste, thereby improve food security and environmental resilience.

Based on the findings of the REAMIT project, we advocate two critical policy actions to help reduce food waste.

- The findings from our project indicate that, while a good proportion of food is wasted in food supply chains, food firms tend to internalise these losses and hence are not very much conscious about this food loss in their supply chains (Ramanathan, R. et al., 2022). If the government encourages food firms to measure food waste, record, compare these levels over time will help firms to think about food waste more clearly (Al Tamimi et al., 2022). When the true costs of food waste is captured in the decision-making processes of food companies, they will be able to take every effort to protect food and reduce waste (Maiyar et al., 2022). This could be a part of UK's food waste strategy and policy.
- The REAMIT project has demonstrated that modern digital technologies do provide significant technological opportunities for reducing food waste in food supply chains. We feel that food companies should be encouraged to utilise the promises of technological solutions to reduce food waste in their supply chains.

Evidence indicates that preventing food from becoming waste helps save significant carbon emissions, compared to utilising the food waste once the waste has occurred. For example redistributing food to other people before it becomes waste will save significant more carbon compared to using the food waste for animal feed or for anaerobic digestion (Parry et al., 2015).

This response reflects the views of our expert research team in the REAMIT project and the University of Essex. They are based on research studies conducted in the project and other relevant work in the field. One paper has been published and more are likely to be published in the next few months. This evidence will focus on only a few of the topics included in the terms of reference that are relevant to our work in the REAMIT project.

1. Climate change and food security: projected effect, risks, and mitigation

1.1. How do existing UK food production, import, and export practices contribute to climate change and biodiversity loss?

- Among other activities being pursued to improve UK food security, the need for reducing the astounding levels of food waste in the country needs to be prioritised.

Huge quantities of food gets wasted in the UK every year. This food waste contributes to climate change in several ways (Ramanathan, R. et al., 2022). First, the food that ends up in landfills emits huge amount of GHGs. Second, significant resources (e.g., energy, water, fertilisers, and human labour) that have been used in producing the food are wasted when the food becomes food-waste. All these resources will have their own carbon footprints. In addition to these contributions to climate change, there are also economic and social implications of food waste. If food becomes a waste, the organisations loses opportunity to generate revenue and contribute to the GDP. While a section of the society in the UK wastes food, there is another section that goes hungry and may be responsible for social unrest. If food waste is saved and used to feed the hungry, several social issues such as crime can be avoided.

2. UK preparedness: Government and market

2.1. How can the UK ensure that enough water is available for crop growing while preventing unsustainable levels of abstraction that can impact the ecology and resilience of our rivers, wetlands and aquifers?

- Reducing the huge amount of food waste in the UK can help in improving water availability. Water is an important resource that goes in food production, and when the food is wasted, the equivalent amount of water that was used in producing the food is also wasted. For example, using life cycle analysis, it has been shown that 125 litres of water are required for producing one apple (Paddison, 2013), and hence when an apple is wasted, we lose the opportunity to use the 125 litres of water for other productive purposes. Hence sufficient policy interventions to reduce food waste can support improved water availability in the UK.

2.2. Does the Government's Food Strategy address the risks of climate change and biodiversity loss adequately? Does it prepare the UK to adapt to a world affected by ecological crises?

- A well-developed food waste policy and efforts to reduce food waste can help address the risks of climate change. For example, similar to the legislation on extended pollution responsibility for firms (e.g., the Environmental Act) or the policy that requires firms to think about their corporate social responsibility practices, we could make a new policy to make firms think about the level of food waste in their operations (Al Tamimi et al., 2022). By making firms to think about food waste annually, we could measure food waste and eventually reduce this waste. It should further encourage food firms to consider using modern digital technologies to help reduce waste in their supply chains.

2.3. Could the UK's land be better used to secure our domestic food supply? What role could community or urban food growing play in increasing the UK's resilience to food shortages caused by environmental change?

- Reducing food waste is usually a low-hanging fruit, as it is easier to protect food and reduce waste compared to other expensive options of securing domestic food supply and increasing UK's resilience to food shortages. More efforts on reducing food waste can help release land for other productive purposes.

3. Securing a sustainable food supply

3.1. Does the Government's Food Strategy put the UK on a path to a secure and sustainable food supply?

- The Environment Act and the net zero strategy are steps in the right direction towards a secure and sustainable food supply in the UK (Government food strategy, 2022 available at

<https://www.gov.uk/government/publications/government-food-strategy/government-food-strategy> accessed 01Dec22). The strategy further talks about the Food Data Transparency Partnership for large companies, and food waste reporting for public organisations.

- We feel the food waste reporting can be extended to all food producers as more policy-level efforts for reducing food waste can lead to a secure and sustainable food supply. As highlighted earlier, the government could encourage firms think about measuring and reducing food waste due to their operations, and further promote the use of technologies for this purpose.

3.2. What are the most environmentally friendly ways of producing a secure supply of nutritious food?

- Reducing food waste is one of the most environmentally friendly and preventive ways of producing a secure supply of nutritious food. This is usually a much easier and cheaper option.

3.3. What role could a reduction in meat and dairy consumption play in improving food security and what measures could the Government take to capitalise on the trend to plant-based diets?

- We have carried out a detailed assessment of waste in beef supply chains and we think there is huge scope for using modern sensing technologies in reducing waste of beef (Duffy et al., 2022). Our calculations using life cycle analysis (da Costa et al., 2022a,b) indicates that, compared to saving vegetables and fruits, significant carbon emissions can be avoided if we prevent meat products from becoming waste. Other extant literature also supports this finding. For example, as per Paddison (2013), the average water footprint of 1 kg beef is 15,400 litres compared to 125 litres for an apple (weighing 150g). Thus, while it is important to reduce food waste from plant-based and meat-based products, the latter should be given preference as it helps save more carbon.

3.4. What role do food technologies have in mitigating the risks that environmental changes poses to UK food security?

- Our research has found that a number of modern digital technologies are very useful in helping firms reduce food waste, especially in food supply chains. By helping to reduce food waste, they can mitigate risks to UK's food security. Food will last longer and remain fresh if they are stored at appropriate conditions (measured via temperature, humidity, lighting, and other related parameters). Modern Internet of Things sensors can help in monitoring these parameters and send them to cloud for remote monitoring (da Costa et al., 2022c). When these parameters are monitored using appropriate data analytics algorithms (e.g., Samriya et al., 2022), timely alerts can be sent to decision-makers via smartphone apps for rapid actions in the case of failure of the refrigeration systems. The REAMIT project has demonstrated the usefulness of these technologies at all levels of the supply chain (production/storage – Ramanathan, U. et al., 2022a, transportation – Ramanathan, U. et al., 2022b; Gillespie et al., 2022) with examples from SMEs and charities in the food industry.
- More futuristic and innovative technologies, such as Raman spectroscopy, holds more promise in mitigating risks to UK food security (Dib et al., 2022). This technology can track the condition of food more closely and can help indicate how close the food is to becoming waste. This can for example help in setting dynamic end-dates of food products.

3.5. Is there research and development the Government could be funding to provide food security solutions?

- Among other options, we strongly advocate that more research and development to help food firms to help reduce waste in their supply chains will support food security. Most of the times, efforts to reduce food waste can be cheaper, quicker and more efficient option than other options (such as growing more food). The funding could be channelled via multiple strands: (i) improved training to help consumers to change their behaviour and reduce food waste; (ii) development of bespoke technology-based solutions for food firms to minimise waste in their supply chains; and (iii) legal and policy options in ensuring that food firms keep measuring food waste in their supply chains, comparing progress over time and making efforts to reduce food waste continuously.

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