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Reducing plastic packaging and food waste through product innovation simulation: Current progress

Christian Reynolds, Lenny Koh, Ramzi Fayad, Jack Pickering, Virginia Martin Torrejon, Deborah Rees, Lori Fisher, Cansu Kandemir, Sarah Greenwood, Adrian White, Rorie Parsons, and Tom Qusted.

Materials Research Exchange Conference, London, 5th October.

@_Reduce_Waste_

@sartorialfoodie

@jackpickering74

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The University Of Sheffield.

Project Overview

Researchers from: City University London, University of Sheffield, University of Greenwich and University of Kent. Funded as part of NERC SSPP Challenge.

Project aim: to build an improved household simulation model which can incorporate plastic waste and food waste.

Revised goal of 5+ products, with multiple possible packaging interventions (30+).

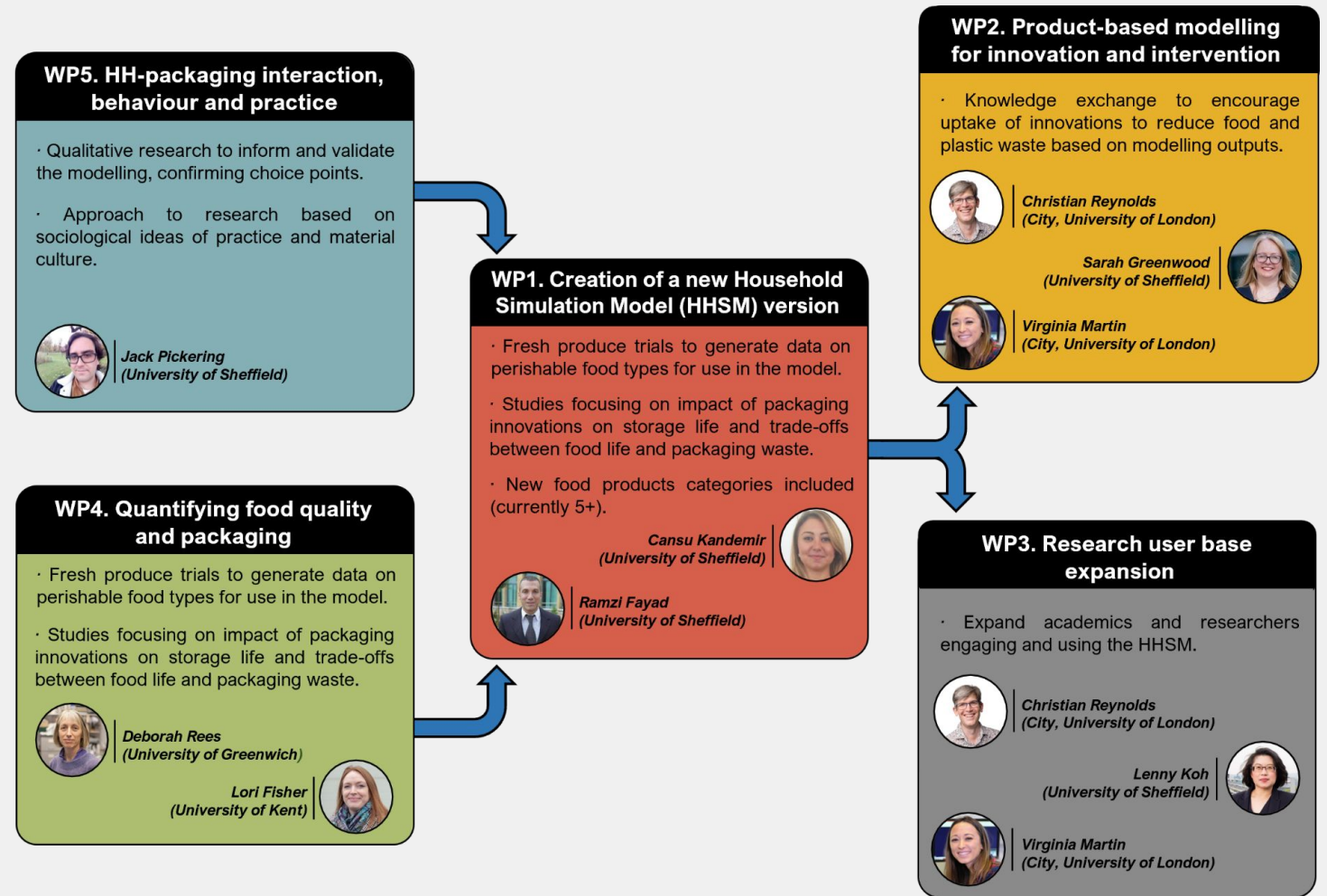


Fig.1: Project structure



The Household Simulation Model

Both plastic packaging waste and food waste can be reduced through product redesign and other household behaviour interventions.

However, it is time consuming and costly to empirically test every intervention to quantify the best solutions to reduce both plastic waste and food waste.

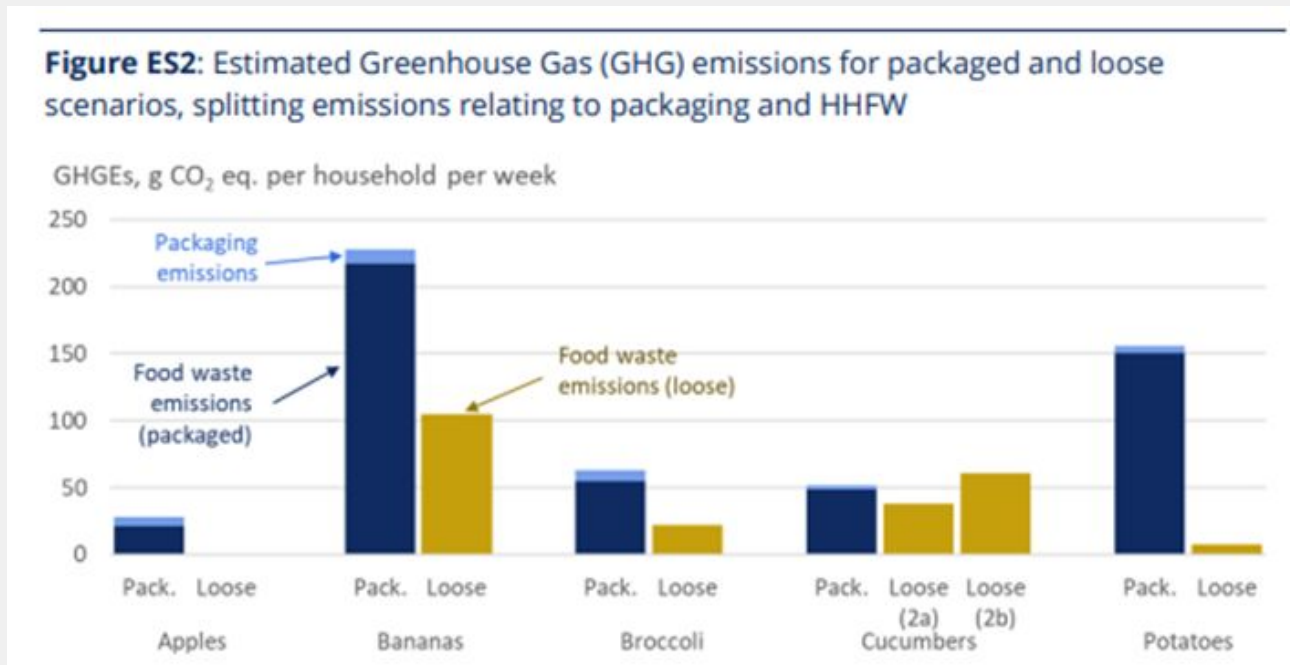
We have built a simulation model to enable exploring product innovation to reduce plastic packaging waste and food waste.





Supporting ongoing advice

Concurrently to this project: The previous version of the household simulation model has been used by WRAP to provide evidence for Loose vs Wrapped, and Best before date use.



Model Progress

- Significantly improved functionality and customizability.
- Chicken breasts model operational.
- Grapes model constructed, validation and verification still to go.
- Mushroom, Milk and Tomatoes planned out.
- Many interventions possible, market and consumption.

Fig.2: Visual depiction of logic flows in Arena software

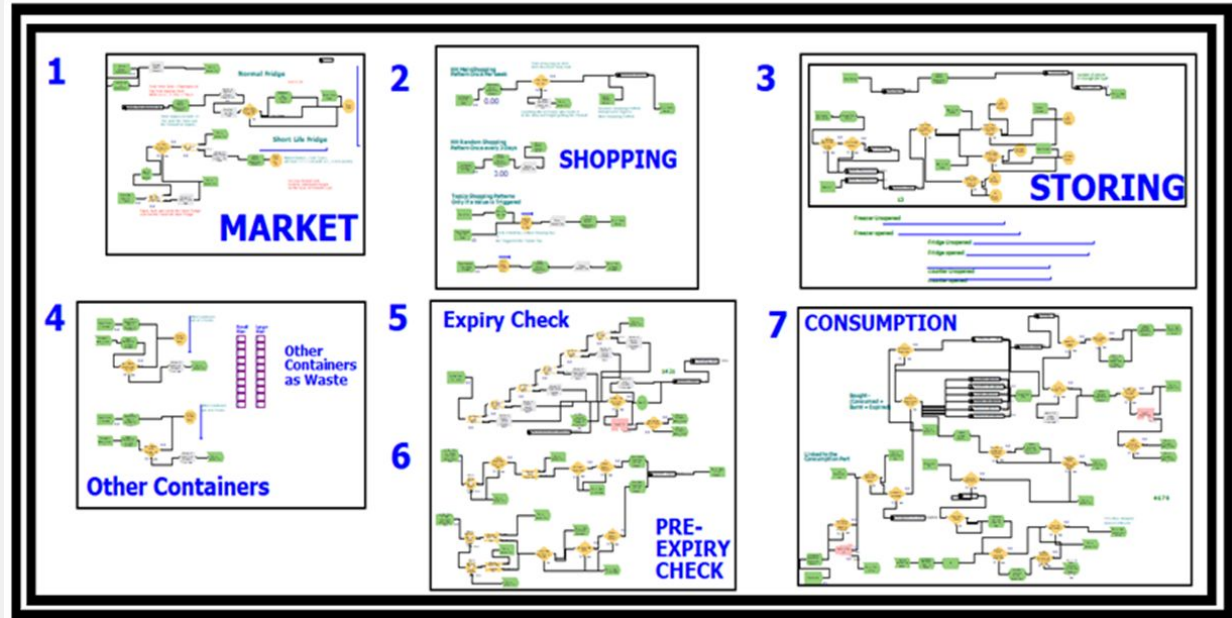
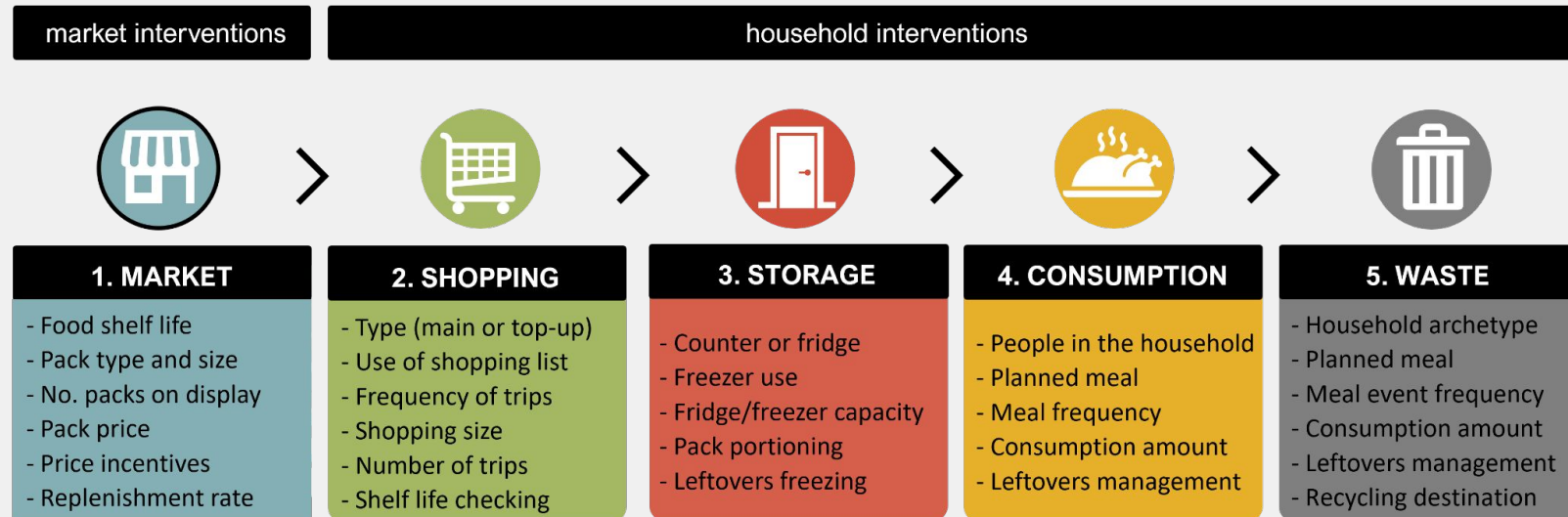


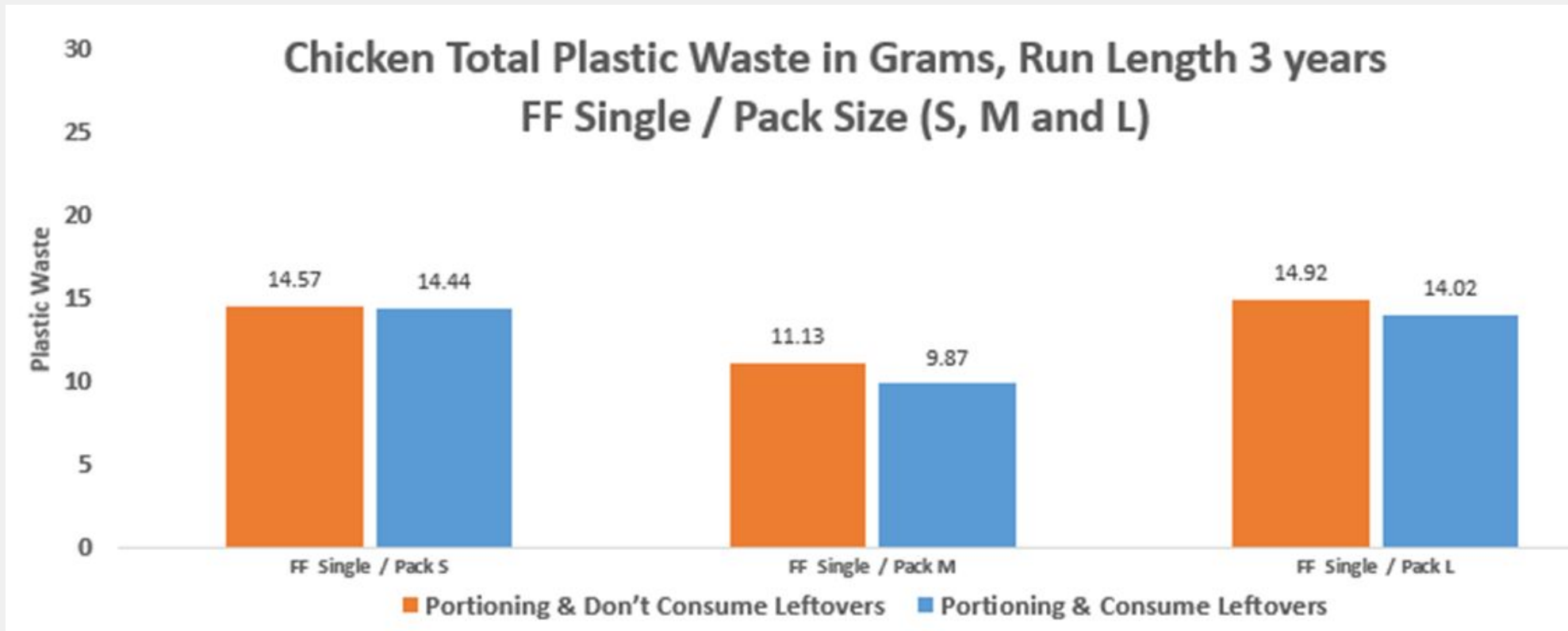
Fig.3: Five module structure of model with interventions.





Results highlights from Chicken Breast Model

Effect of pack size and behaviour interventions: small, medium and large pack types.



Functional Fulers (FF) single person household, changes to pack sizes (small, medium, large) exclusively available in-store



Results highlights from Chicken Breast Model

Effect of pack size interventions, and behaviour changes, simulated by household archetype.

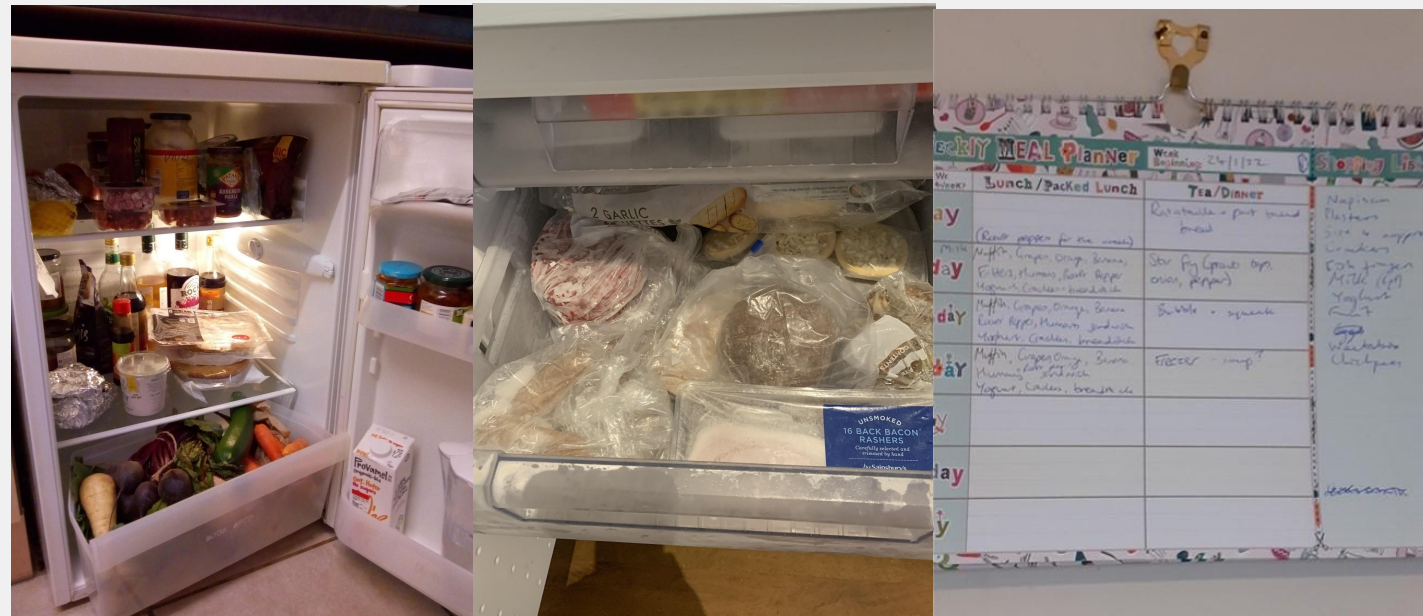


Pressured Providers (PP) Family of 4 including 2 Teenagers, Changes to level of freezer use.

Contributions from WP5 and future directions

- Qualitative research (28 interviews, 25 food and waste diaries) informed aspects of functionality of new model.
- Wider findings: planning practices, meal bulging & batch cooking, and connections between freshness and plastic packaging.
- Starting new research project focussing on new packaging innovations and developments currently in the pipeline, to tailor future simulation model runs to needs of industry.

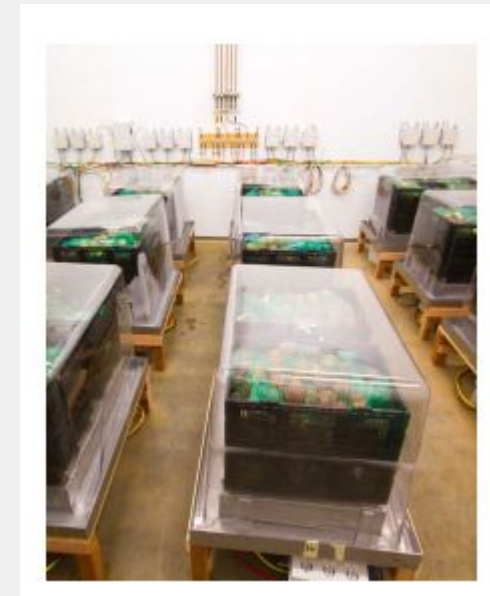
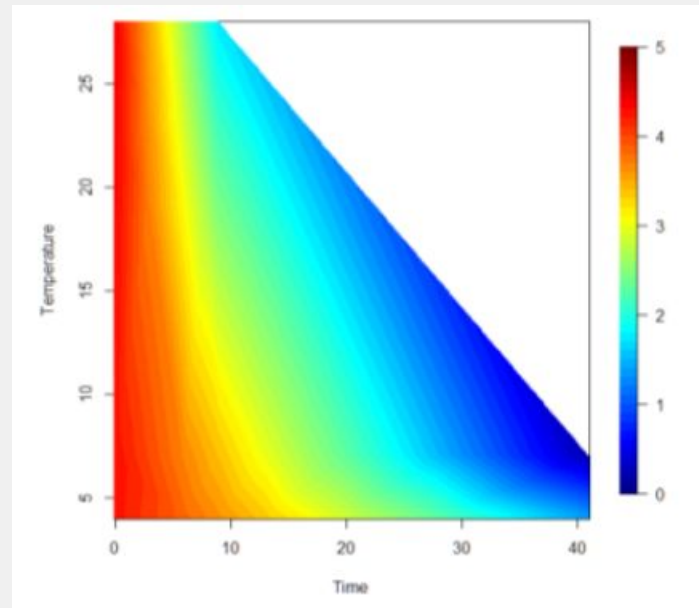
Fig.5: Images from research participants





Contributions from WP4 and new concepts

- Developed deterioration score in the Grape fresh produce trials- enables hybrid simulation that can handle expiry dates and product evaluation.
- Fresh produce trials planned for a number of other products. (Mushrooms, Tomatoes etc)





Conclusions and Future plans

- Multiple model runs based on variety of interventions and packaging types.
- Focus on new/innovative packaging forms where possible.
- Work on more complex scenarios that require altering model: freezing capacities, new refill and return systems of provision, e.g.
 - Milk bottle delivery (Glass vs plastic, refill, doorstep delivery etc)
 - Edible coatings vs packaging
- Industry and Policy Workshops to build specific models - please do contact us.



The HHSM team present findings at WRAP, Banbury, September 2022



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Many thanks to NERC and our collaborators.

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