EU cofin Project Annual Report 2018
The EU projects that receive co-finance from the top sectors must submit an annual report on their technical and financial progress. This format is to be used for reporting the technical progress. The report must be submitted by 15 February 2019 to Hans van der Kolk

General information	
TKI Number of the project	**AF-EU-16008**
Title	**REFRESH**
project leader WR (e-mail address)	**Hilke Bos-Brouwers (Hilke.Bos-Brouwers@wur.nl)**
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Start date	**1 juli 2015**
End date	**30 June 2019**

Short description/aim project (this information can be published on a website of the TKI/Topsectors)

REFRESH (Resource Efficient Food and dRink for the Entire food Supply cHain) is an European Research and Innovation Action project, funded by the H2020 programme under Grant Agreement No. 641933). The overall aim of the REFREHS project is to contribute significantly towards the SDG 12.3 objective of halving food waste at retail and consumer level and reduce food losses in the supply chain b 2030, and maximizing the value from unavoidable food waste and packaging materials. Developing a 'Framework for Action' model that is based on strategic agreements across all stages of the supply chain to support transformation towards a more sustainable and secure EU food system, benefitting Europe's economy, environment and society. Wageningen Research will aim to be the innovation partner for sustainable growth, collaborating with frontrunner, innovative SMEs, industrial and societal partners.

Planning and progress Is the project going according to plan? Are there any substantive bottlenecks? If yes, please explain with a brief description of the current situation

At December 2018, REFRESH is at month 42 of the project. REFRESH delivered to the Commission its second Report (M19-36) which was reviewed in October 2018. The overall planning of REFRESH is according to plan, with a small amount of deliverables experiencing delays of 1-4 months in time. These delays are caused by high quality standards, and the effort put into creating cross-WP and multidisciplinary inputs and discussions. The quality of the work is highly appreciated by the Project Officer and external reviewers. To finalise within the timeframe of the projects, all WP leaders have aligned their efforts and coordinate the work to complete before June 2019 and present all results during the final meeting in May 2019 (in Barcelona).

Highlights and deliverables in 2018 / so far (this information can be published on a website of the TKIs/Topsectors)

WP1 (Consumer Insights): A large 4 country survey (NL, ES, HU, GE; N=4000) to empirically test the impact of consumer motivation (awareness, attitudes, norms), abilities (skills and knowledge), and opportunity factors (availability of products, accessibility to stores, availability of storage equipment, prevalence of unforeseen events) on household practices related to food waste prevention as well as on the amount of household food reported to be discarded. To ensure that the data would be of

high quality, two pilot studies have been conducted to construct measurement scales. The study presents a range of quantified insights about in-home food waste. The results improve our understanding of what determines household food waste, and provide insights into potential targets for food waste reduction and intervention strategies. Furthermore, an analysis of the influence of ICT-based tools (apps) on food waste behaviour of consumers was implemented via literature study and a 3 week focus group study in which 3 applications were tested in real life. The results provide insights on the influence of ICT tools on behaviour, how it relates to food waste and summarises design principles for future successful ICT tooling. Also, the influence of on-pack information on behavioural intentions of consumers was studied via an online viral survey in 4 countries (N=3513). Results indicate that consumers find the date labels useful, especially for chilled products, although a good proportion of consumers would ignore dates for some products, instead relying on their senses. Moreover, labelling guidance on storing fresh produce in the fridge, and on using freezers to extend product life for bread, was well received and hold potential to change consumer behaviour in order to reduce food waste. A 4th study was conducted on consumer acceptance of by-product valorisation for direct (functional ingredients) or indirect (feed) human consumption. A social experiment was carried out in the context of parents' choices of their children's school meals. In particular, a group of parents heard evidence from experts about the four different food valorisation methods, discussed them and choose between hypothetical menus with valorised foods in two sessions. Results indicate that citizens accept different valorisation methods, with gleaning of vegetables as the most accepted practice, followed by feeding pigs with eco-feeds. Citizens were more critical of the excessive handling and processing of foods in the process of recycling ingredients and feeding by-products to animals.

WP2 (Business Engagement): In 4 countries (NL, ES, HU, GE) plus China Piloting Working Platforms were established, which developed a common Agenda, actions (including monitoring and piloting activities), communication (e.g. campaigns). The mid-term evaluation of the platform meetings was performed via a short survey and scoping interviews with platform initiatives. The concept of a Blueprint approach for replication and upscaling of this VA/Frameworks of Action approach was developed, and first tested during a WP3/Policy workshop session discussing Voluntary Agreements as governmental instrument to stimulate food waste prevention in the entire supply chain. The online Community of Experts was launched (www.refreshcoe.eu), and agreement was made to integrate this platform into the EC DG Santé EU Platform on Food Losses and Waste to ensure continuation after the runtime of the REFRESH project.

WP3 Po(licy): 2 reports were published on Systems maps and analytical framework – mapping food waste drivers across the food supply chain; and 'review of EU policy areas with relevant impact on food waste prevention and valorisation. Also , 3 Policy workshops were organised on Animal Feed, Voluntary Agreements and Consumer Behaviour, convening various stakeholders to discuss on policy impact & implications on food waste prevention and reduction. Also, 4 Policy Briefs were created (VA, Unfair Trading Practice, Consumer Behaviour and Animal Feed). These will feed into the finalisation of the work into Food Waste policy recommendations, to be published in 2019.

WP4 (Behavioural Economics): Within this WP, models to integrate computational modelling (Bayesian Networks and Agent Based Modelling) approaches to simulate various scenarios within consumer and business networks. 4 scientific papers were published describing businesses and consumer behavioural typologies and the reduction of complexity in the identification of food waste drivers. The first concepts to implement simulations for the implications of different policy interventions and selected innovations were set-up, and will be finalised in 2019.

WP5 (Environmental impact): Based on the theoretical approach a simplified approach for estimating and comparing different valorisation option was developed serving as theoretical background for the FORKLIFT tool (FOod side flow Recovery LIFe cycle Tool). LCA and LCC inventories have been carried out for populating the FORKLIFT tool. Full LCA and LCCs inventories been carried out for nectarine and peach supply chains cases

in Italy. The inventories will be extended to UK and Spanish case studies. Environmental and cost impacts of the application of the Japanese system to valorise meat-containing food waste as pig feed was investigated. Finally, based on a mass balance approach, LCA and LCC models have been set up and inventories of the German meat production chain have been carried out. Based on the same approach, a model for the European tomatoes chain has been developed and the inventories have been started. These will be finalized in 2019.
WP6 Valorisation: Based on the prior selection of most important waste streams in EU, the compositional database tool FoodWasteExplorer has been created and launched (https://ws.eurofir.org/foodwasteexplorer), including more than 25,000 data points. A decision support tool for guidance on technical and legislative issues has been created for the UK situation, and will be extended to NL and ES example cases. This is available via the REFRESH Community of Experts. Contributing to the technical guidelines, a detailed microbiological risk assessment on meat content of food waste have been completed, including a seminar with external experts. Also, a technical and policy workshop making use of the Japanese example of feeding swill to pigs and chickens has been organised to analyse technical requirements and feasibility to engage in EU-based, certified and dedicated reprocessors to divert food surplus towards animal feed. U sing Targeted Genomic Evolution Technology (TarGET), genes of critical importance to the proliferation of Pseudomonas *fluorescens* on a defined, mixed food waste have been identified and important metabolic pathway criteria inferred. Gene lists associated with metabolic processes that have been conditional for the successful strains have been produced. This provides information useful for further development of microbial conversion of waste into specific chemicals using biotechnology approaches. Trials for producing food ingredients have been conducted, and a model breakfast cereal drink has been successfully formulated using surplus chicory root fibre. Good results have been achieved in consumer acceptance testing with student panels. Based on these results a positive business model is considered possible.
WP7 on dissemination tracked all communication activities of the Project; WP8 is the management workpackage to coordinate the Project.

Number of delivered products in 2018 (in an appendix, please provide the titles and/or description of the products or a link to the products on public websites)			
Academic articles	Reports	Articles in journals	Introductions/workshops

Appendix: Names of the products or a link to the products on a public website
All REFRESH published reports are on www.eu-refresh.org

Overview of scientific publications

https://www.wur.nl/nl/Onderzoek-Resultaten/Topsectoren/show/REFRESH-vermindering-van-voedselverspilling.htm

Type of scientific publication	Title of the scientific publication	DOI	ISSN or eSSN	Authors	Title of the journal or equivalent	Number, date	Publisher	Place of publication	Year of publication	Relevant pages	Public & private publication (1)	Peer-review	Is/Will open access provided to this publication
Publication in Conference proceedings/Workshop	Combining life cycle assessment and costing for food waste prevention and valorization			Fabio De Menna, Jennifer Davis, Karin Östergren, Nicole Unger, Marion Loubiere, Matteo Vittuari			Italian Society of Agricultural Economics conference	Bisceglie (Italy)	2017		No	Yes	Yes - available in Green Open Access
Article in Journal	Donation management for menu planning at soup kitchens	10.1016/j.ejor.2018.06.005	03772217	Marjolein E. Buisman, Rene Haijema, Renzo Akkerman, Jacqueline M. Bloemhof	European Journal of Operational Research	272/1	Elsevier BV	Netherlands	2019	324-338	No	Yes	Yes - available in Green Open Access
Publication in Conference proceedings/Workshop	An integrated framework for the assessment of life cycle costs and environmental impacts of food waste			Fabio, De Menna; Jennifer, Davis; Karin, Östergren; Nicole, Unger; Marion, Loubiere; Matteo, Vittuari	Resource Efficiency e Sustainable Development Goals: il ruolo del Life Cycle Thinking -		Atti del XI Convegno della Rete Italiana LCA, Roma	Rome (Italy)	2017		No	Yes	Yes - available in Green Open Access
Thesis/Dissertation	Quantifying food wastage of main agrifood products and its carbon footprint: Case of Germany Master's thesis for the Master's degree program, Environmental Engineering,In the institute of Chemical Engineering, Biotechnology & Environmental Technology,Faculty of Engineering,At the University of Southern Denmark			Neele Praß			University of Southern Denmark	Denmark	2016		No	No	No
Publication in Conference proceedings/Workshop	A common framework for assessing life cycle impacts of food waste prevention, valorisation & treatment		978-3-200-0-04777-8	Unger, N.; Davis, J.; Östergren, K.; Loubiere, M.		8-11 November 2016	website of Recy&Depotech 2016	Austria, online	2016		No	No	Yes - available in Gold Open Access
Publication in Conference proceedings/Workshop	On the effectiveness of food waste reducing actions in a meat supply chain			ME Buisman; R. Haijema; JM Bloemhof-Ruwaard; JCAM Snels	Herbert, U., & Kreyenschmidt, J. Cold Chain Management	6 June 2016	Bonn University	Bonn, Germany	2016	81-88	No	No	No