



# Evaluation Framework for Action Innovation projects

**A series of Case Studies from Germany, The Netherlands, Hungary and Spain**

## **Acknowledgments & Disclaimer**

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# 1 Overview

REFRESH is an EU H2020 funded research project which aims to bring together stakeholders from all stages of the food supply chain and lead them closer towards the goal of reducing food loss and waste. The project consists of 7 work packages (WP), focusing on 6 main areas: consumer food waste, the food supply chain, optimized valorisation of food processing side streams, impact assessment, policy and multi-stakeholder collaboration. The project started in July 2015 and finishes in June 2019.

One of the work packages, WP2, addresses the areas of multi-stakeholder collaboration and the food supply chain. Through WP2, REFRESH aims to design and pilot food waste voluntary agreements (VAs) across four EU member states and subsequently assess their potential for wider adoption.

For each of the four pilot countries, participants of the Frameworks for Action were expected to undertake a number of innovative projects to tackle food waste. In total (across all countries) 14 innovative pilot projects were undertaken, 13 of which have been made into individual case studies and uploaded to the [REFRESH Community of Experts](#).

This publication catalogues the case studies, however the evaluation of the innovative pilot projects and how they align with REFRESH WP2 can be found in a separate report REFRESH D2.8 - Evaluation of Framework for Action pilots.”

## 2 Germany



# ALDI SÜD consumer information campaign on consumability of milk beyond the “best before date”

## Overview

### The need

Research has shown that many consumers in Germany still throw away perishable foods such as milk, even when it would still be safe to consume [1]. One reason for this behaviour is that when the product reaches its “best before date”, consumers typically don’t test if the product can still be consumed before throwing it away.

### The solution

ALDI SÜD and partners tested the effect of imprinting “Smell me! Try me! I am often good for longer” on fresh milk packaging to encourage customers to check whether the milk could be consumed after the “best before date”.

### The benefit

In an accompanying consumer survey, more than 75% of respondents (12% more than before the packaging change) stated that when checking the consumability of milk, they were now more likely to pay attention to external factors such as smell or taste, rather than just the “best-before date”.

Discount supermarket tests new labelling on fresh milk packaging in 400 selected stores in southern Germany; promoting sustainable consumption practices.

ALDI SÜD is a large discount supermarket based in Western Germany. It is represented in 11 countries with over 6,200 stores; employing approximately 148,900 individuals, of which about 47,100 are based in Germany [2]. The supermarket sells a wide range of products - around 1600 core range food and non-food products and 110 specials offered each week.

## Background

As an organisation, ALDI SÜD is committed to climate protection. In 2015, it joined the Paris Climate Agreement; working to keep global warming well below 2°C. In 2017 it became the first large grocery retailer in Germany to achieve carbon neutrality [3]. However, beyond the internal measures adopted to reduce the organisation’s climate impact, ALDI SÜD also works to improve its customers’ awareness around the subject of climate protection.

One area of particular interest is the issue of household food waste. In 2017, ALDI SÜD started to increase its consumer communication of food utilisation and shelf life through the “[Rescue Leftovers](#) - Reste Retten” campaign; reaching approximately 12 million individuals via multiple communication channels, such as Facebook and Youtube [4]. In addition to the “Rescue Leftovers” campaign, ALDI SÜD worked with YouGov Deutschland to develop and conduct market research; determining consumer views on the topic of food waste. The survey showed that almost



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*"With the new notice, we are encouraging consumers to first check the status of their milk before pouring it out when it reaches its best-before date"*

*Dr. Annett Entzian, CR Manager at ALDI SÜD*

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half of all respondents (44%) discard food because they are unsure whether it is still edible [5].

This confusion over the edibility of food items can also be associated with product date labels. It is expected that household food waste is often generated because consumers throw away food when it reaches its "best-before-date", even when it would still be safe to consume.

In fact, a 2018 published German study (conducted on behalf of the Federal Ministry of Food and Agriculture) estimated that 5.8% of all avoidable food waste that's generated in private households is disposed of because it has passed its best-before-date. Further breakdown of food types estimated that dairy products represented the largest proportion of the 5.8%; with 42,000 tonnes being discarded each year due to dairy products passing their best-before date. The study also revealed almost half (45.7%) of all foods disposed of after an expired best-before-date were still unopened; of which 52.9% was made up of dairy and finished products [1]. This study shows that more needs to be done to address consumer attitudes towards dairy product date labels.

## What was the solution?

ALDI SÜD, together with its supplier Gropper, supports an initiative to encourage consumers to quality-check milk after the expiration of the best before date. This collaboration was initiated by another REFRESH partner, the Bavarian State Ministry of Food, Agriculture and Forestry (StMELF), and the Bavarian alliance, "[We save food](#)". The phrase "Smell me! Try me! I am often good for longer! - We rescue food" was printed on milk cartons to raise awareness among customers. Another aim was to understand whether this printed message would make it more likely for customers to consume fresh milk after the best before date instead of throwing it away.

The imprint was chosen to raise awareness of the significance of the best-before-date and the fact that products are often still edible after the best-before date has been exceeded. By adding this label, customers are encouraged to learn to rely more on their own senses (smell, taste).

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*This pilot showed that our customers perceive the information and, above all, adapt their behaviour accordingly. We are pleased that this measure enables us to contribute to a better acknowledgement of the value of food."*

*Dr Julia Adou, Head of Corporate Responsibility at ALDI SÜD*

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Figure 1: Examples of the explanatory notes added to milfina milk cartons (©ALDI SÜD)

## Implementation

Since February 2018, ALDI SÜD has been testing the imprint of the MHD (best-before date) label on fresh milk in around 400 stores in southern Germany, specifically in Bavaria [6]. Their aim was to improve consumer awareness of the difference between the best before date and the consumption date by including an explanatory note on milk cartons.

The explanatory note [Figure 1] was printed on milfina fresh milk (fat levels 1.5 % and 3.5 %). The impact of the note was assessed using a consumer survey, which was commissioned by StMELF [6] and conducted by POSPulse. Two survey rounds were carried out, before and after the introduction of the explanatory-notice respectively. After having purchased milfina fresh milk at home, consumers gave feedback on their behaviour via apps. The questions related to their behaviour in relation to the best-before date in comparison to the assessment of external factors. In the second round, consumers were also asked concrete questions about their assessment of the explanatory note as such.

## Outcomes

Results from the consumer survey indicate that the test consumers were sensitised to the issue of food waste by the additional notice on the milk packaging.



More than 75 % of respondents stated that when checking the consumability of milk, they were more likely to pay attention to external factors such as smell or taste than to the best-before date printed on it. This was 12 % higher than before the change in packaging design. Additionally, more than 80 % of consumers perceived the campaign as an invitation to be more environmentally conscious when dealing with food, and around 85 % rated the campaign "Save your milk" as either "important" or "very important" [6].

## Thoughts for the future

ALDI SÜD was the first food retailer in Germany to decide, by the end of 2018, to print "best before" information nationwide on other selected product packaging. In addition to milk, ALDI SÜD customers will be asked to rely on their sense of smell and taste when checking the product life of other types of dairy products e.g. fresh cheese and young Gouda [6].

The measure has shown that many consumers do not know the difference between the best-before-date and the consumption date and that exceeding the best-before-date leads to uncertainty about the product life. It is therefore important to carry out such campaigns and to raise consumer awareness accordingly.

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# Extending purchasing tolerances to enable selling of “crooked” carrots and apples

## Overview

### The need

“Second class” fruits and vegetables are often not sold by retailers as it’s believed consumers often prefer “perfect” products. In recent years retailers have started to challenge this notion; selling “imperfect” fruit and vegetables. Many retailers view this as an opportunity to simultaneously reduce food waste and boost sales of otherwise unsaleable products.

### The solution

In order to show its customers that there’s nothing wrong with the quality of so called “ugly fruits or vegetables” or “misfits”, in summer 2017, ALDI SÜD started to sell Class II carrots and apples.

### The benefits

The project further supported the promotion of sustainable consumption. Additionally, the sale of the “Krumme Dinger” was scientifically evaluated to identify the causes of food losses and indicate to ALDI SÜD further reduction potentials.

Discount supermarket changes customer perceptions of “imperfect” fruit and vegetables following the sale of crooked produce across its distribution area in Germany

ALDI SÜD is a large discount supermarket based in Western Germany. It is represented in 11 countries with over 6,200 stores; employing approximately 148,900 individuals, of which about 47,100 are based in Germany [1]. The supermarket sells a wide range of products - around 1,600 core range food and non- food products and 110 specials offered each week.

## Background

As an organisation, ALDI SÜD is committed to climate protection. In 2015, it joined the Paris Climate Agreement; working to keep global warming well below 2°C. In 2017, it became the first large grocery retailer in Germany to achieve carbon neutrality [2].

However, one common problem experienced across the grocery retail sector (contributing to the climate change problem) is consumers’ desire for “perfect” produce. “Too bulky”, “too skewed” and “too crooked” - in the public debate, “requirements for external characteristics of food” are cited as one reason for food waste, particularly in the fruit and vegetable sector [3]. Depending on the product (and also seasonal effects), at some periods between 5 (e.g. apples) and 40 (e.g. carrots) percent of fruit and vegetables do not reach supermarket shelves [4] - partly because of “visual flaws” such as deformations or discolorations.

Raising awareness and changing perception can help to convince consumers that taste is unaffected by visual defects. In Germany, PENNY has been successfully selling fruit and vegetables with shape and colour defects under the name “[Bio-Helden](#)” since 2016.



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*"By offering 'second-rate' goods, we are extending our purchasing tolerances and setting an example against food waste in the supply chain. At the same time, we want to convince our customers that even fruit and vegetable products with minor visual defects can still be of excellent taste."*

*Kristina Bell, Group Buying Director and responsible for Quality Assurance and Corporate Responsibility at ALDI SÜD*

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## What was the solution?

In 2017, ALDI SÜD decided to take similar action in an aim to understand how much food waste would be reduced by selling "misfit" fruit and vegetables. To do this they proposed a pilot project whereby they would extend their purchasing tolerances on apples and organic carrots. Both products are mainly sourced from Germany and are strong in sales. ALDI SÜD was able to refer to German producers and to make a statement about the real availability of class II products. The aim was that this would draw attention to this cause of food waste, change consumer perceptions and subsequently encourage sustainable consumption.

## Implementation

Under the label "Krumme Dinger" ("crooked things"), ALDI SÜD started to offer Class II organic carrots [Figure 1] from the end of August 2017, and Class II apples from the end of September 2017. "Krumme Dinger" products can have optical blemishes, caused by agricultural conditions, such as weather.



**Figure 1:** Examples of "Krumme Dinger" apples and organic carrots (©ALDI SÜD)

Through REFRESH, ALDI SÜD also collaborated with the Institute for Sustainable Nutrition (iSuN) at Münster University of Applied Sciences, who have been actively involved in the reduction of avoidable food waste for several years. The iSuN were asked to: 1) provide scientific evaluation of "Krumme Dinger" sales, 2) identify the causes of food losses, and 3) identify potential areas for further food waste reduction within the ALDI SÜD supply chain.

Communication on product packaging included a specially developed icon reading



“Crooked in shape. Flawless in taste” and also included storage information for customers: “To maintain the quality, please store the carrots unpacked in the vegetable compartment of your refrigerator.”

## Outcomes

The evaluation of the activity showed, that in the case of carrots, the amount of Class II goods is actually very low. Therefore, the share of additionally marketed fresh goods by the “Krumme Dinger” was marginal. In the case of apples however, the proportion of additionally marketed fresh produce from “Krumme Dinger” is significant.

On the consumption side, it was highlighted that the “Krumme Dinger” contribute to customer sensitisation and to increasing appreciation of food (particularly as the customer actively and consciously decides to purchase the “Krumme Dinger” products).

## Thoughts for the future

Lessons learnt by ALDI SÜD included that the effects on sustainability must be assessed on a case-by-case basis for each type of fruit and vegetable. This is also due to the fact that Class II goods that are not marketed as fresh are usually marketed through other distribution channels such as the processing industry.

Against this background, ALDI SÜD continuously checks for which other products it is worthwhile to also offer consumers as “Krumme Dinger”. This can also depend on external influences (e.g. weather within a season) and decisions can therefore be taken on a seasonal or regional basis.

As part of the ALDI SÜD group, the Austrian retailer HOFER, for example, started in 2018 to also offer field cucumbers, courgettes, tomato and paprika rarities as “Krumme Dinger”.

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# PENNY review packaging solutions which could reduce food waste at home

## Overview

### The need

Using the right packaging for perishable food products can significantly extend a product's shelf life. In combination, studies have shown that smaller packaged portions can contribute to consumers buying the quantity of product that best suits their needs.

Therefore, it is expected that optimising the packaging of perishable food products could lead to an overall reduction in household food waste.

### The solution

PENNY wanted to assist consumers with new packaging solutions to reduce food waste at home. PENNY wanted to find packaging solutions that are more environmentally friendly, not too costly and reduce plastic waste.

The CSCP and WRAP examined if there were any packaging solutions that fulfil these criteria.

### The benefit

The scoping exercise revealed interesting insights into potential packaging solutions, but unfortunately could not be brought into practice as the solutions were not ready for the mass market.

Review of packaging solutions provides some insights into how PENNY staff can further assist customers in their efforts towards more sustainable consumption

PENNY is one of the leading discounters in Europe. In Germany, 27,000 employees in around 2,180 stores generate a turnover of 7.4 billion euros. The discounter belongs to the Cologne-based REWE Group [1].

## Background

PENNY is very concerned about the conscious handling of food and its packaging. The organisation works to reduce the amount of food waste produced in households by providing information on their website on the best ways to store several different food products [2]. PENNY recognise that by storing food products correctly consumers could significantly increase the shelf life of their food.

In combination with appropriate storage, improving packaging design can also increase the shelf life of perishable food products; as well as providing consumers with the opportunity to purchase and use the quantity of product that best suits their needs. Both characteristics are expected to reduce the amount of household food waste produced [3].

After work with REFRESH on an employee engagement training project relating to food waste, PENNY was keen to explore further opportunities to help its customers reduce food waste in their homes through implementing packaging changes. Their vision was to initiate pilot projects on re-sealable packaging and packaging that prolongs shelf-life.



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*There were very interesting discussions and creative packaging solutions identified for both selected product groups. Unfortunately, they were not yet suitable for the mass market. The topic is still an extremely relevant one for PENNY."*

*Mirka Stark, Senior Project Manager for Sustainability at the REWE Group*

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PENNY was particularly looking for packaging solutions that:

1. offer the customer added value by increasing shelf life
2. allow customers to use smaller portions without changing product volume (e.g. resealable packaging)
3. cause less plastic waste; and
4. represent a more sustainable solution than existing packaging.

## What was the solution?

PENNY, in collaboration with REFRESH, the Collaborating Centre on Sustainable Consumption and Production (CSCP) and the Waste and Resources Action Programme (WRAP), designed a series of activities and identified key objectives.

- 1) Conduct a scoping exercise to:
  - Identify best practices and inspiration from the market
  - Develop (scientifically- and experience-based) suggestions for relevant product groups to focus on
  - Provide background on consumer challenges in the context of packaging and food waste and its relevance to new/other packaging solutions
- 2) Identify options for changes by analysing pack audits
- 3) Organise a workshop with relevant category managers and/or buyers to discuss:
  - economic, environmental and social impact (e.g. ease/cost to manufacture, marketing viewpoint of consumer messaging) and likelihood of success of various packaging options for selected products
  - the impact of changes on different functions and the likelihood of success
  - recommendations for packaging changes to help PENNY consumers reduce food waste.



## Implementation

In late 2017-early 2018, the CSCP, with the support of its UK REFRESH partner WRAP, conducted the initial scoping exercise for PENNY.

One focus area of the analysis was how changes to packaging could contribute to the reduction of food waste in households. PENNY also identified re-sealable packaging for bread or salad bags as an area of interest for the scoping study. These products were chosen as PENNY identified them as the products with the highest potential for change; innovative packaging solutions for products such as meat, sausage and cheese already exist across PENNY stores.

PENNY also specified that the products analysed in the scoping activity:

- Contribute to the reduction of food waste in households (i.e. not specifically focused on increasing shelf life)
- Are alternatives to plastic
- Can be resealed; and
- Are economically competitive

## Overview of potential solutions

	Contribution to the reduction of food waste at home	Alternative to plastic	Reclosability	Cost details
<b>Active packaging</b>				
Modified Atmosphere (MAP)				> 1c
Breathable microperforated package				> 1c
Oxygen-scavengers				> 1c
Moisture regulating materials				> 1c
Ethylene Absorber				> 1c
Antimicrobial surface coatings				
<b>Preportioned packaging</b>				
<b>Flexible packaging</b> , e.g. Zip resealing				
<b>Ready for sale packaging</b>				

**Figure 1:** Overview of some considered potential packaging solutions and their fit to the up-front identified project criteria, e.g. applicability to bread and lettuce, reduction of food waste at home, alternative to plastic, reclosability, cost.



## Outcomes

The scoping exercise revealed that a solution which simultaneously reduces food waste, avoids plastic and is less cost-intensive does not currently exist. Whilst some packaging solutions have the potential to reduce consumer food waste, many of these are innovative solutions that are not yet being used in the mass market. As a result, many innovative packaging options are likely to be more cost-intensive than existing solutions.

The analysis revealed that whilst reusable packaging is less cost-intensive and reduces plastic waste, product life is not necessarily extended. However, reusable packaging was seen as an opportunity to strengthen consumer communication.

The project team suggested as an option to test each packaging solution separately among consumers (e.g. with focus groups) to ascertain the impact of each packaging solution on household food waste. One key objective identified was to hold a workshop with buyers and relevant category managers. It was recommended that if such a workshop were to be held, the involvement of an external expert would provide meaningful exchange about possible solutions and selected product categories.

## Thoughts for the future

The scoping exercise revealed that under the pre-defined criteria, there was unfortunately insufficient material to conduct activities 2 and 3 outlined at the start of this pilot project ("What was the solution" section above). As a result, the CSCP and PENNY decided together to park this project.

PENNY is committed to supporting its customers to reduce food waste at home and it is anticipated that this concept could be revisited.

Although not all project activities could be conducted, one success of the pilot project was that it kept packaging issues on the agenda and showed all participants of the REFRESH Steering Committee that it is a very important topic. The German REFRESH coordinator, CSCP, is confident that the research results could be used for a future food waste and packaging project.

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# Food waste employee engagement at PENNY

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## Overview

### The need

Every year, each German discards approximately 55 kg of food [1]. It is likely that this level of food waste is partly due to consumer uncertainty about how to act, and what to do, to tackle the problem.

### The solution

Inspired by the REFRESH project, PENNY and CSCP developed a program to train 800 new employees on food waste. The aim was that this would:

- Raise awareness of food waste at PENNY
- Contribute to PENNY's strategic focus on food waste
- Enable the apprentices to contribute to food waste reduction in their professional as well as in their private life

### The benefit

Apprentice feedback on the training was very positive. This was evident from questionnaires as 96% of apprentices (443 respondents) said that the training had raised their awareness of food waste. In addition, the feedback suggested that the training inspired conversations about food waste, as 80% of the apprentices said that they had discussed food waste with others since completing the training.

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Training for more than 800 Penny apprentices improves food waste awareness and inspires conversations about food waste

PENNY is one of the leading discount supermarkets based in Europe. The organisation has approximately 2,180 stores in Germany and employs 27,000 staff. PENNY has a turnover of around €12 billion (2017) and store sales in Germany generate around €7.4 billion [2]. The discounter belongs to the Cologne-based REWE Group.

## Background

Every year, each German discards approximately 55 kg of food, of which about 44% could have, in principle, been avoided [1]. As a retailer, PENNY is aware of its environmental and social responsibility and is concerned about the conscious handling of food. PENNY actively contributes to the appreciation of food and has been committed for many years to support the continuous reduction of food waste.

PENNY has been keen to explore, in cooperation with REFRESH partners, how employees could reduce food waste. PENNY was particularly looking to develop a new food waste training program for its apprentices. Their vision was to equip these new employees with the knowledge and practical solutions to reduce food waste in their professional and private life.

## What was the solution?

Inspired by the REFRESH project, PENNY and The Collaborating Centre on Sustainable Consumption and Production (CSCP) developed a concept to train new apprentices on food waste. WRAP were able to share experiences from the "[Your Workplace Without Waste](#)" program, and helped to inform the process and content of the training program.

## Implementation

PENNY and CSCP decided to implement a "train-the-trainer" approach; where CSCP trained 12 staff members at PENNY on the topic of food waste who, in turn, rolled out the training



to apprentices. The training was integrated with the existing apprenticeship program so that it was received by all new employees.

Prior to implementation, PENNY and CSCP developed the necessary materials for training which included:

- A PowerPoint for a “train-the-trainer” workshop
- A PowerPoint for trainers to use in the apprentice session, including speaking notes (“Guideline for trainers” - Figure 1)
- Posters of PENNY supermarket layouts for interactive working sessions

*“The apprentice training within the framework of REFRESH was a very successful activity. We are satisfied that we were able to anchor the important topic of the appreciation of food and the great importance of reducing food waste even more firmly in our company. We are assessing a repetition with new trainees.”*

*Mirka Stark, Senior Project Manager for Sustainability at the REWE Group*



Figure 1: Cover page and table of contents of the guidelines for trainers



The “train-the-trainer” workshops took place over a 3.5-hour session, then each PENNY trainer delivered food waste training to groups of apprentices in 2-hour sessions. The training included information on: consumer tips (including smart grocery shopping), storage and use of leftovers, stock and market information, and challenges in the market. Apprentices were then encouraged to take part in a competition where they proposed “creative ideas for customers to avoid food waste”. PENNY received more than 200 entries, including many creative, fun and innovative ideas.

PENNY anticipated that the training would:

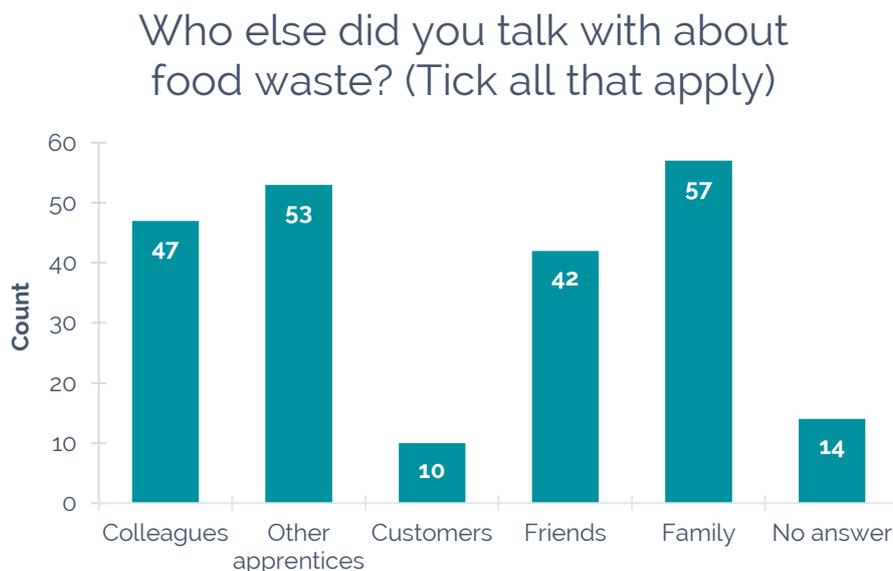
- Raise awareness of food waste at PENNY, including hot spots in supermarkets that would benefit from future solutions
- Contribute to PENNY’s strategic focus on food waste and to their sustainability priorities
- Enable the apprentices to contribute to food waste reduction in their professional and private lives

The impact of the training was assessed through feedback questionnaires, which were completed immediately after training and again 6 months later. Feedback was gathered from trainers for the train-the-trainer workshops and from apprentices for the apprentice training sessions.

In total, over 800 PENNY apprentices, from three consecutive years of apprenticeships, were trained between fall 2017 and summer 2018.

## Outcomes

Initial feedback questionnaires showed that 8 out of 12 trainers felt they could “raise the apprentice’s awareness of food waste” after taking part in the “train-the-trainer” workshop. This was evident from apprentice questionnaires, as 96% of respondents (443 apprentices) confirmed that the training had raised their awareness of the issue.

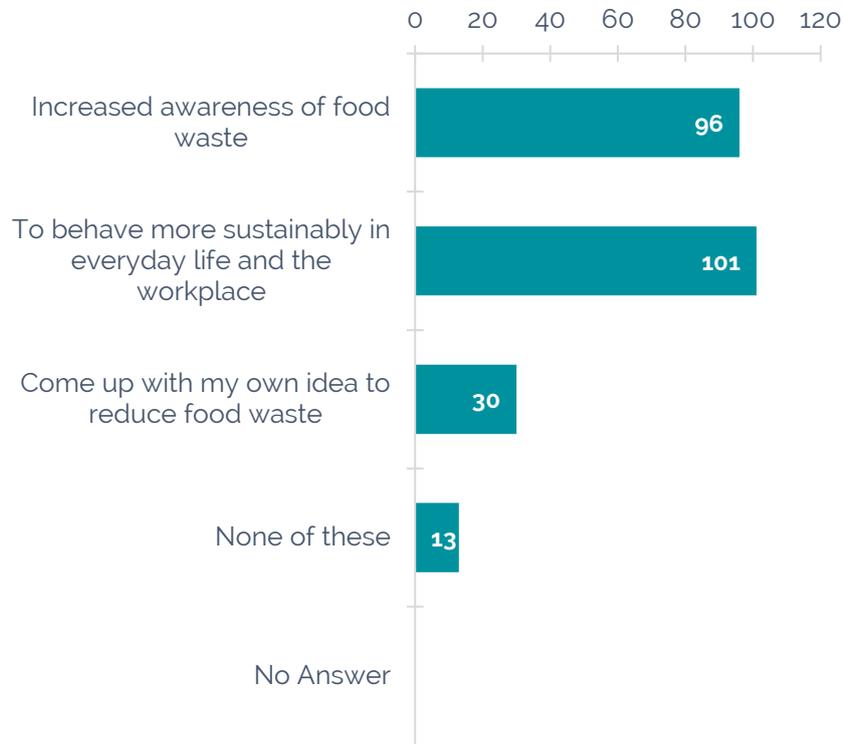


**Figure 2:** The type of person apprentices spoke with about food waste, after the food waste training program at PENNY. Reported in evaluation 6 months after training (179 respondents)



After 6 months, apprentices completed a second questionnaire. The number of respondents dropped from 443 to 179, mainly because one third of the apprentices had finished their apprenticeship by this time and could no longer be reached. But of those respondents, 80% said that they had discussed food waste with others since completing the training. Results show that PENNY apprentices discussed food waste most with colleagues, friends and family, but only 10 apprentices said they had spoken to customers about food waste [Figure 2]. However, over half of the apprentices (179 respondents) described an increase in food waste awareness and felt that the training taught them to behave more sustainably in the workplace and at home [Figure 3]. The results closely match the objectives set out by PENNY and the training was considered successful.

### What did you learn from the food waste training? (Tick all that apply)



**Figure 3:** What apprentices felt they learnt from the food waste training program. Reported in evaluation 6 months after training (179 respondents)

### Thoughts for the future

PENNY works on the topic of food waste with their employees, customers and stakeholders. Raising the awareness of employees, especially new employees, is a valuable basis for improving, for example, the distribution of food to social institutions and charities. Here, market employees can exert direct influence.

PENNY continues to have a strategic focus on food waste and are considering the continuation of this training as part of their apprenticeship program.



Results from the questionnaires show that the PENNY “train-the-trainer” approach was effective at raising awareness of food waste in-store and at home. For anybody interested in pursuing a similar path, PENNY confirms that the “train-the-trainer” concept has proven effective and that the topic is very popular with young people.

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## **3 Netherlands**



# From cash to trash: The effect of price promotions on food waste

## Overview

### The need

Retailer price promotions are often considered to be responsible for food wasted by consumers. However, not much is known about how specific types of price promotions impact food waste.

### The solution

An international team of scholars conducted a household survey among members of a consumer panel who purchased one of eight specific food products; either on promotion or for the regular price. The aim was to understand the relationship between different forms of price promotions (single-buy deals, for example: cents-off/percentage-off, and different types of multi-buy deals, for example: buy one, get one free) and household food waste.

### The benefit

Contrary to expectations, this research showed that multi-buy sales promotions did not increase the propensity of consumers to waste the product that was bought on discount. By understanding the impact of price promotions we can better understand the causes of household food waste.

Research suggests it is wrong to assume that price promotions result in increased levels of household food waste

## Background

Retailers are under a lot of pressure from governmental and non-governmental organisations to reduce food waste. In response, many initiatives have been taken by retailers to reduce food waste, such as standardising expiration labels on products and introducing lines of “ugly” misshaped fruits and vegetables.

At the same time, retailers are under attack for transferring the problem to the household. By using multi-unit (or quantity) promotions, retailers may encourage consumers to buy more than they need, which can in itself increase household food waste. Or, as a previous vice chairman of the environment board of the UK Local Government Association, put it: “BOGOF [buy-one, get-one-free] deals, which give consumers a few days to munch through 16 clementines, are not about providing value for money. They are about transferring waste out of retail operations and into the family home” [1].

## What was the solution?

The project was conducted by an international team of scholars working in price promotions, retailing and food



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*BOGOF [buy-one, get-one-free] deals, which give consumers a few days to munch through 16 clementines, are not about providing value for money. They are about transferring waste out of retail operations and into the family home."*

*Councillor Clyde Loakes, vice chairman of the environment board of the British Local Government Association*

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waste; affiliated with Tilburg University, Vrije Universiteit Amsterdam, ESADE Business School, and Wageningen University. The aim of the research was to understand the relationship between different forms of price promotions (single-buy deals, for example: cents-off/percentage-off, and different types of multi-buy deals, for example: buy one, get one free) and household food waste.

Dutch households from the [GfK](#) household panel (who keep track of the products that they buy each week) were asked to complete a survey about their consumption and waste behaviour relating to recently purchased food products. These products came from a list of eight, all of which had a limited shelf life, and which were purchased at a major Dutch food retailer either when they were or were not on promotion. The approach builds upon

REFRESH work on [price dynamics](#) and similar [research](#) conducted by WRAP.

## Implementation

For products that are perishable and often on promotion a subset of households were surveyed approximately one to two weeks after purchasing a particular food product and were asked how they used the product and how much of the product they consumed/wasted. The following food products were included: grapes, kale, haricots, lettuce mix, truss tomatoes, cut vegetable mix, special breads, and rolls. Consumers were not specifically told to purchase these products but were recruited for surveys when GfK household data indicated that they had purchased one of them. Data collection took place in January and February 2019.

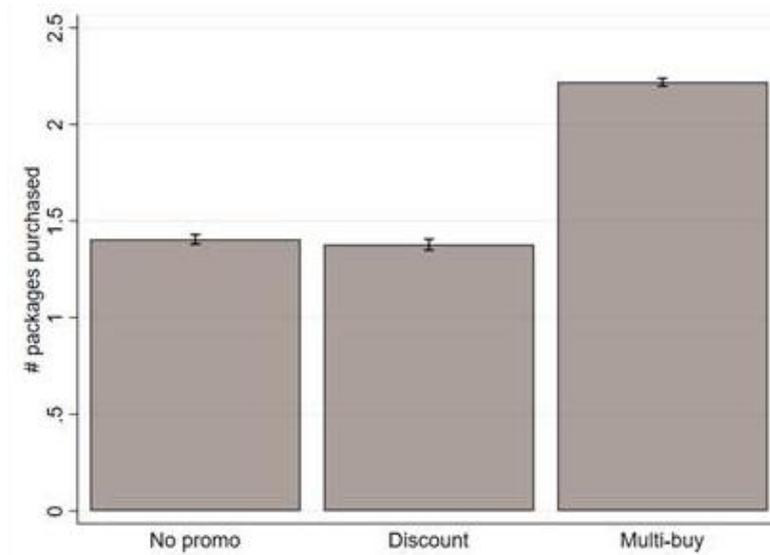
The survey was conducted following weeks where there was, for any of the included products:

1. no promotion for the product;
2. a single-buy deal for the product (for example: 50% off);
3. a multi-buy deal for the product (for example: 1+1 free)



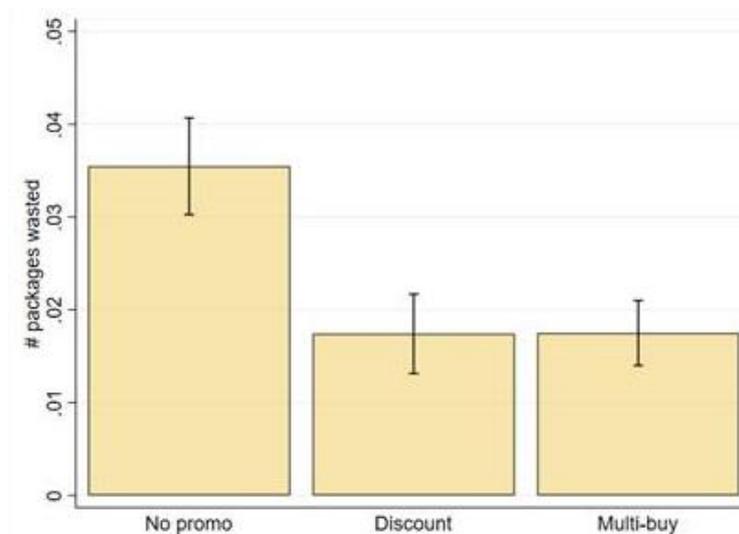
The research was partly funded by REFRESH and partly from other sources such as AiMark.

## Outcomes

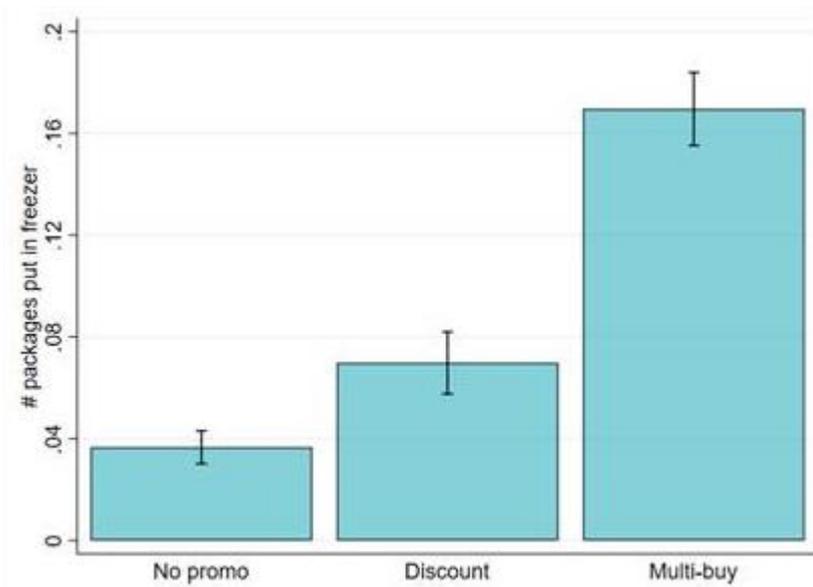


**Figure 1:** The average (mean) number of packages purchased by survey participants, split by promotion type. Error bars represent standard errors of the mean. (n observations = 2,547, n households = 1,646)

The results showed that consumers purchased more multi-buy packages than those not on promotion or as part of a single-buy deal [Figure 1]. However, contrary to expectations, multi-buy sales promotions did not increase the propensity of consumers to waste the product that was bought on discount [Figure 2]. If anything, it appears that the propensity to waste is less, because products are more likely to be frozen [Figure 3].



**Figure 2:** The average (mean) number of packages wasted by survey participants, split by promotion type. Error bars represent standard errors of the mean. (n observations = 2,547, n households = 1,646)



**Figure 3:** The average (mean) number of packages put in the freezer by survey participants, split by promotion type. Error bars represent standard errors of the mean. (n observations = 2,547, n households = 1,646)

## Thoughts for the future

This has important implications. Public opinion has been critical about the behaviour of retailers with respect to food waste and have viewed retailers as pushing products upon consumers through promotions such as the infamous ‘Buy one, get one free’ promotions. Consequently, the House of Lords European Committee has urged supermarkets to stop these types of promotions, and several supermarket chains have indeed started to phase out multi-buy offers. The assumption that multi-buy offers increase food waste was, however, not empirically tested in a systematic way in prior research. Our results suggest that this assumption is faulty, and that the empirical basis to support a ban on buy-one-get-one-free and similar multi-buy offers is absent.

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# The Defaulted Doggy Bag

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## Overview

### The need

Food waste in the Hospitality and Food Service sector is a significant problem. In the UK it was estimated that in 2016 wasted food cost this sector £3 billion [1]. Furthermore it was estimated that 34% of the food that was wasted in this sector came directly from consumer plates [1]. In Europe, taking leftovers home from a restaurant can lead to both feelings of pride about not wasting and feelings of embarrassment due to violating a social norm [2].

### The solution

The current default situation is one in which asking for and offering a doggy bag is uncommon. This study examines whether changing the default situation will lead to higher uptake of doggy bags, and whether this also translates into less food waste. Three experiments were conducted in which the effects of changing the default situation and offering choice on doggy bag uptake were examined.

### The benefit

Based on the findings, advice can be given to restaurants who want to limit plate waste, about how to advocate the uptake of doggy bags.

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The effects of changing the default and offering choice on doggy bag uptake

In Europe, taking leftover food home from restaurants (i.e., using doggy bags) results in a paradox between conflicting norms and emotions. The personal norm not to waste conflicts with feelings of embarrassment that can arise when customers are required to ask for doggy bags to take their leftovers home [2]. To counter this, restaurants can attempt to normalise the use of doggy bags.

## Background

Food waste in the Hospitality and Food Service sector is a significant problem. In the UK, for example, one study estimated that the cost of food being wasted from the UK Hospitality and Food Service (HaFS) sector was £3 billion for 2016. Furthermore, the same study estimated that approximately 34% of this wasted food was directly from consumer plates [1]. One approach to addressing the issue of avoidable food waste being discarded from consumers plates is the use of “doggy bags”. Doggy bags refer to bags or containers that are provided by restaurants, in which consumers can put any leftover food for later consumption.

When consumers are faced with the choice of accepting or not accepting an option, how the choice is presented to them has a huge impact on their decision (e.g. opting in or opting out). In the case of doggy bags, if an “opt-in” approach is adopted, where customers must ask for a doggy bag, this may not suffice for consumers to take a doggy bag home. On the other hand, providing an “opt-out” option,



where consumers receive a doggy bag unless they indicate otherwise, may increase the use of doggy bags. However, this alone is not going to diminish food waste unless consumers eat the leftover food rather than discard it at home.

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*"Encouraging the offering and accepting of uneaten food is important, because it isn't food that is actually waste. It's food that can be eaten and shouldn't be in the bin."*

Ryan James, chair of Glasgow Restaurant Association, <https://www.heraldscotland.com/news/16084550.would-you-be-embarrassed-to-ask-a-restaurant-for-a-doggy-bag/>

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## What was the solution?

Through REFRESH, Wageningen University developed a project to investigate how different approaches to the distribution of doggy bags in restaurants could impact:

1. The uptake of doggy bags
2. Whether the leftover food was consumed later

Specifically, the research aimed to look at four different strategies that could be adopted:

### Strategy 1:

Consumers were provided the option to take a doggy bag, but needed to explicitly ask for one

- This is the current practice at restaurants

### Strategy 2:

Consumers were given the option to take a doggy bag by indicating whether they wanted one (yes/no)

- This aligns with the consumers' personal norm not to waste

### Strategy 3:

Consumers were presented with a doggy bag unless they explicitly said that they did not want one

- This is different to the current practice in which doggy bags are not offered unless the consumer requests one.

### Strategy 4:

Consumers were given a choice between a plastic or a cardboard doggy bag

- By providing a choice between two options, this implies that using a doggy bag is the default/norm and preserves the customer's sense of freedom.



Three different experiments were undertaken to assess which strategy is the most effective in encouraging the use of doggy bags to reduce food waste.

## Implementation

Experiments took place in succession throughout 2018. In the first experiment, a group of 50 student participants were presented with a situation judgement test. Participants were asked to read a restaurant scenario and answer questions about a) whether they would use a doggy bag or not and b) how they would feel about their choice.

In the second experiment, a group of 178 students from Wageningen University were presented with a crackers taste test. On the final instruction sheet, participants were presented with one of the four strategies regarding taking leftover crackers home.

In the final experiment, a group of 167 students from Wageningen University were offered a free lunch (Figure 1) at the cafeteria. Consumers were presented with one of the same four strategies as in the second experiment. In addition to examining whether consumers took a doggy bag or not, participants were contacted a week later and asked whether they had consumed the leftover food that they had taken home.



Figure 1 - An example of the free lunch provided in the final experiment



## Outcomes

The first experiment established that the existing social norm was to leave the food (72%) rather than take a doggy bag (6%). The results also suggest that the use of doggy bags indeed reflects a situation in which social norms are not aligned with personal feelings about behaviour. After reading the restaurant scenario, participants indicated that they would feel less guilt, more pride, less anger towards themselves, but also more shame, when asking for a doggy bag compared to leaving leftovers on the plate.

In the second experiment, when consumers were presented with a doggy bag irrespective of whether they requested one (Strategy 3), the use of doggy bags was 69.6%. In contrast, when Strategy 2 was presented, and consumers were simply provided the choice of using a doggy bag, uptake was 37.5%. The results suggest that to increase the uptake of doggy bags, they need to be offered to consumers as a default, since merely providing the choice, even very explicitly, is not as successful.

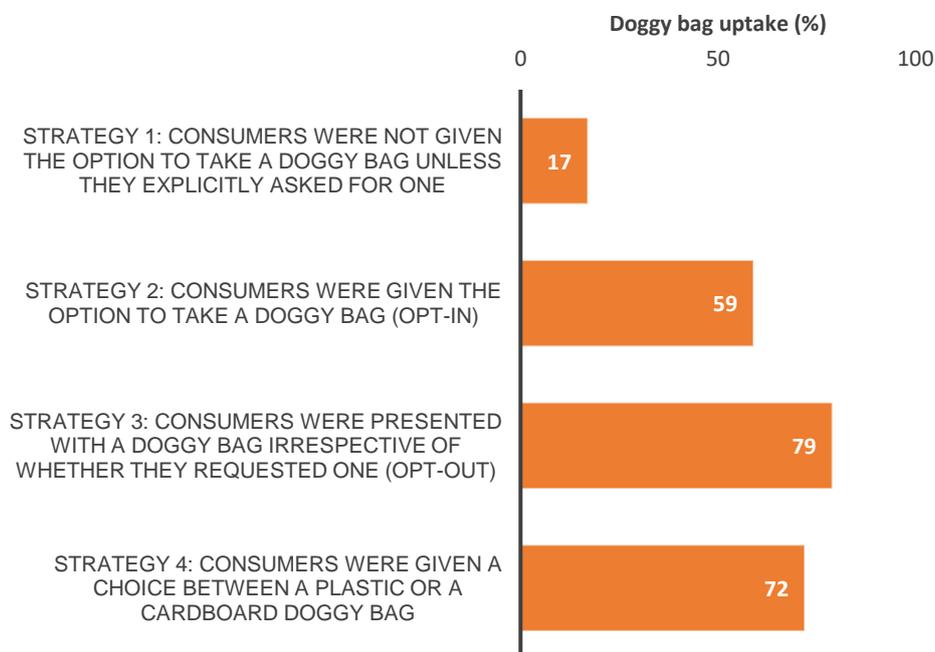


Figure 2 - Experiment 3 - The percentage of participants using doggy bags for each tested strategy



In the final experiment, when consumers were not explicitly presented with the option to take a doggy bag (Strategy 1), uptake was low (17 %) (Figure 2). However, when choice was provided (Strategy 2), 59 % of consumers would choose to take a doggy bag. When consumers were presented with a doggy bag irrespective of whether they requested one (Strategy 3), uptake was high at 79 %. When presented with the option of a plastic or cardboard doggy bag (Strategy 4), uptake was also high at 72 %. The difference between Strategy 3 and 4 was not statistically significant. The likelihood of eating (at least part of) the food in the doggy bag was high (89.3%) and not significantly different between each of the strategies.

## Thoughts for the future

Changing the doggy bag default from a consumer request to a strategy in which doggy bags are presented unless the consumer indicates that he/she does not want one appears to be an effective way to entice consumers to take home leftover food from restaurants. There was no evidence that this transfers food waste from the restaurant to the home; rather, consumers are likely to eat leftover food regardless of the influence strategy used. For restaurant managers, providing choice to consumers might be advisable as this could increase consumer satisfaction with the restaurant, although this is unlikely to affect the likelihood of taking a doggy bag.

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## 4 Hungary



# Food waste household activation programme in Hungary

## Overview

### The need

In the EU, more food is wasted in households than in any other sector: processing, production, wholesale and retail, and food services [1]. According to estimates, the average Hungarian household wastes about 90 kg food annually [2], which equates to 10 % of total food purchases [3].

### The solution

The Hungarian Food Bank Association created a simple and cheap e-mail-based programme to help consumers reduce food waste at home. The programme invited consumers to test different food waste reduction solutions. Following testing consumers were then asked to provide feedback on usefulness and the ease of implementation of each solution.

### The benefit

The solution improved food waste knowledge and skills in 265 households all over Hungary.

Food waste activation programme improves food waste awareness and home practices for more than 1200 householders

The project has been managed by the Hungarian Food Bank Association (HFBA), the biggest food surplus redistribution organisation in Hungary, in cooperation with the Budapest Business School (BBS) and TESCO Hungary.

TESCO has been a strong partner of HFBA, both in food rescue activities, as well as in communication activities. The BBS Sustainability Centre regularly works with various partner organisations by allocating groups of students to help implement sustainability related projects. BBS approached HFBA and offered cooperation in a food waste related project involving their students.

## Background

In 2016, REFRESH published a report highlighting qualitative and quantitative consumer research [2] on household food waste attitudes and practices in four EU countries: Germany, Spain, The Netherlands and Hungary. The report detailed valuable and up-to-date information on Hungarian consumers and provided insights for designing, testing and implementing a programme to activate consumers, to increase food waste reduction activities at home.

The HFBA has a background in consumer education activities, and in 2012 implemented a food waste information campaign in collaboration with TESCO. Within this campaign a website was launched which highlighted the issue of food waste and provided householders with a platform where they could share their own tips on how to reduce food waste at home. However, feedback on the usefulness of these tips was not collected.



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*"Food waste is in the core of sustainability issues. We are glad Budapest Business School could participate in the program and I am sure our students who were actively involved in the project have also benefited by taking home many practical learnings on how to save food in their everyday life"*

— *Andrea Nagy - Head of the Budapest Business School Sustainability Centre*

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## What was the solution?

Following the 2012 food waste information campaign, the HFBA wanted to develop a project which would answer two questions:

1. How effective are different tips at reducing household food waste?
2. How easy is it to implement each tip?

The overarching aim of the project was to create a consumer activation programme which reduced household food waste. HFBA proposed to achieve this by developing a programme which:

- Uses the insights of the REFRESH consumer research, namely the "National, Qualitative insight on Household & Catering Food Waste" report [2]
- Is easy and relatively cheap to implement
- Brings measurable results (behaviour change)
- Motivates consumers to act
- And, is easily replicable in other countries

The BBS provided a group of students to help develop the programme plan and materials to be used in the project. The group of students were also responsible for conducting a small-scale pilot of the proposed methodology. In addition, TESCO offered the use of their communication channels for the project and also offered prizes to incentivise households to participate.

## Implementation

Following programme design, households were recruited through multiple channels:

- Foodbank Facebook page, newsletter to 50,000 people
- Tesco Facebook page
- Tesco invited their employees to join, with separate motivational presents
- BBS newsletter
- PR activities, such as talking about the programme on the radio



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### *Participants' feedback:*

*"We received good information and it reinforces good things by asking about them. I already was quite conscious in this field, but now I developed further."*

*"Indeed, I found expired or close to expiry food. Since I knew that we will not eat these in the near future, I gave a part of them away."*

*"I think this programme is a very good initiative. Especially the tips on how to lengthen the lifetime of food. Since this programme, I pay more attention to use close to expiry food."*

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Participants were first required to fill in an online questionnaire about their food waste attitudes, motivations and habits. For comparability, this project used the same questions that were used in the REFRESH consumer research [4]. The questionnaire (adapted slightly from the original by HFBA) would then be repeated after the programme to provide an indication of how the project had influenced consumer food waste behaviour.

Following completion of the initial survey, participants then had the option to choose between 3-4 different food waste reduction tips over three consecutive weeks which they could implement within their household. Participants were asked to choose at least one of the 3-4 tips to try in a given week.

### Tips offered to participants:

- Screen the stock at home
- Plan their meals in advance
- Make a shopping list (and write on the back of it any additional items purchased)
- Use and eat close-to-expiry food at home
- Cook smaller quantities
- Prepare inventory of freezer content and add labels
- Freeze leftovers
- Cook with dried bakery products
- Cook with leftovers
- Learn the appropriate storage method of preferred fruits and vegetables

The participants were then required to provide feedback (on a weekly basis) on the tips they had implemented and their perceived effectiveness in reducing food waste. As an incentive for participation in the questionnaires, participants who completed all the questionnaires were entered into a prize draw. The prizes were donated by TESCO and included: a smoothie maker, for using leftover fruit and vegetables, and multiple high-quality food boxes, for storing and freezing leftovers.

### Outcomes

In total, 523 people registered to take part in the programme, however the actual number of participants was 265 (85% women; 37% aged 35-49; 38% from Budapest; 44% in two person households). When factoring the number of



people in each household, it is expected that the programme reached over 1,200 people. Feedback from the participants was positive and the programme was well received (see testimonials on previous page). The project also seemed to have an impact on the food waste behaviour of participating households, showing an increase in the number of participants agreeing with positive food waste reduction statements (Figure 1).

The percentage increase in respondents who agreed with different food waste reduction statements (difference between final and initial questionnaire responses)



Figure 1 - Changes in self reported food waste behaviour following the project

The tips that most people chose to try were:

- Learn the appropriate storage method of your preferred fruits and vegetables
- Make an inventory of your freezer contents and add labels to items
- Use and eat food that is close to its expiry date

The tips that people subjectively considered more effective in reducing food waste (on a 1 to 5 scale) were:

- Cook with leftovers from previous meals
- Freeze leftovers
- Use and eat food that is close to its expiry date

The tips that people subjectively considered easier to implement (on a 1 to 5 scale) were:

- Screen the stock at home, consume the close-to-expiry items



- Freeze leftovers
- Make a shopping list (and write on the back of it the items purchased additionally)

As shown above, the tip which was considered one of the most effective and was also tested widely was “Use and eat food that is close to its expiry date”.

## Thoughts for the future

The programme proved a useful tool for changing consumer behaviour. Nevertheless, participants gave a lot of valuable feedback and ideas for improvements. Areas for improvement included:

- Tailoring tips for specific groups e.g. under 30’s or households with children
- Techniques for convincing family members to reduce their food waste
- More information on certain topics
- More tips
- Involvement of famous people
- Dissemination of the programme via video

Additionally, it should be recognised that this program reached many people who were already quite open to the topic of food waste. As such, it’s important to search for solutions to reach and activate those individuals who are less open and know less about the topic.

Finally, based on the REFRESH research, organisations interested in running a similar project would benefit from:

- Adding a commitment line in the registration (recruitment) form with a compulsory tick box: “Yes, reducing food waste is an important issue for me. Therefore, I join this initiative and I pledge to pay attention to this in my home during the next couple of weeks.”
- Selecting the tips and tasks that prove most effective in reducing food waste
- Advertising that the program’s main message is about easing people’s guilt caused by throwing food out.

It is expected that these considerations were highly influential in the success of the project.

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## Just like home

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### Overview

#### The need

The levels of per capita food waste are often significantly higher in event catering than in hotels, restaurants or cafes. It is estimated that on average 20-30% of food is wasted at catering events in Hungary. The special circumstances connected with planning and executing events often make food saving difficult as the consumer is typically not the "paying client".

#### The solution

An Event Catering Food Waste Reduction Guideline was developed by the REFRESH Hungarian Pilot Working Platform and implemented at 11 business catering events in Hungary. Events were branded as "Food Saving Events" and organisers were given a "Food Saving Event" logo to use as a trademark.

#### The benefit

Food Saving Events were highly appreciated by event organisers and guests. In addition, average food waste was measured at 9% across these events. Due to positive results, it is expected that more "Food Saving Events" will be run across Hungary in the future.

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The Event Catering Food Waste Reduction Guideline issued by the Food Value Forum provides practical advice for event organisers on how to organise and execute a "Food Saving Event".

The Food Value Forum (FVF) is a Pilot Working Platform of the REFRESH project that works to reduce food loss and food waste in Hungary. The FVF welcomes many organisations including: companies, non-profit organisations, administrative bodies, production chain operators and their industrial/professional organisations, as well as organisations from both research & development and education sectors.

### Background

When considering food waste within the hospitality and food service sector people can often overlook food waste associated with catering events. Event catering is a special segment of the HORECA (HOTel, REStaurant, CAFé) sector with a special supply chain where the "eating guest" typically does not order catering services, and the "paying client" is usually a company or organisation organising the event. In event catering there are also logistical factors which can increase food waste. For example, open-air locations and unpredictable weather can often lead to high no-show rates at events, which in turn leads to pre-prepared food being discarded. Redistribution from event catering also requires extra effort and logistical capabilities. In addition, many locations do not house fully-equipped kitchens, and food storage facilities can be limited. It is because of these circumstances that oversupply in event catering is very common and causes significant levels of food waste.

### What was the solution?

A project was developed and managed by the [Hungarian Food Bank Association](#) (HFBA) in collaboration with the [Business Council for Sustainable Development in Hungary](#) (BCSDH), [HORECA Marketing Klub](#), and the [Hungarian](#)



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*“Saving food in event catering is fully in line with the Action 2020 program of the Business Council for Sustainable Development. We were therefore happily participating in the project and we have also successfully used the Guideline and decreased food waste when organising our biggest event in Hungary, the BCSDH Business Lunch”*

*— Irén Márta, Director of BCSDH.*

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[Food Chain Safety Office](#). The aim of the project was to create a common understanding about the issue of food waste amongst people across the whole catering supply chain (from caterer to consumer) with a strong focus on over-ordering and oversupply.

It involved the creation of an “Event Catering Food Waste Reduction Guideline”, using evaluation of industry best practices. Event organisers who followed the Food Waste Reduction Guideline would be able to brand their event as a “Food Saving Event” and use the specially designed event logo (Figure 1). The guideline and logo are the first steps to creating a “market standard” for food waste awareness events in event catering across Hungary. It is anticipated that the guideline and accompanying logo will be adopted in other countries.



Figure 1 - The logo for "Food Saving Events"

## Implementation

At the beginning of the project, international industry best practices were reviewed; concentrating on existing guidance documents for sustainable event organisation, food waste aware catering and redistribution practices. Following this, event organisers and caterers were consulted through interviews to discuss existing food saving practices and any barriers associated with further reductions in food waste.

Information was then collated to produce an [“Event Catering Food Waste Reduction Guideline”](#) (Figure 2). The guideline includes chapters on Planning and Preparation, Execution, Involvement of guests, Redistribution, Measurement and Evaluation. A checklist



of the most important tasks to undertake was included in the guideline and a “Food Saving Event logo” was designed by the authors in both Hungarian and English.

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*"I am always very angry when I participate at various conferences and I see the amount of food not eaten and being wasted at the end of the event. I was already thinking myself that I will bring boxes with me and take away all leftovers. I am very happy to see this event is not wasting food and I am of course happy to cooperate by not producing any plate waste!"*

*— Testimonial of an event guest*

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#### Event Catering Food Waste Reduction Guideline



Figure 2 - The front cover of the "Event Catering Food Waste Reduction Guideline"

Food waste was measured before and after implementation of the guideline and logo at 11 events (1,320 participants) with buffet type services (Figure 3) . Feedback from clients helped inform revisions to the guideline and an open registration [web page](#) was created for clients to join an online community of Food Saving Events.



Figure 3 - A photograph taken at one of the "Food saving events" in Hungary



## Outcomes

Food waste at the 11 events was 9% on average, ranging from 8% (Figure 4) to 17%, this equates to a 50-70% reduction in food waste when compared to the average food waste produced at catering events in Hungary. Feedback from event guests was positive and overall there was almost zero waste from guests' plates.

### USAGE OF FOOD AND DRINKS

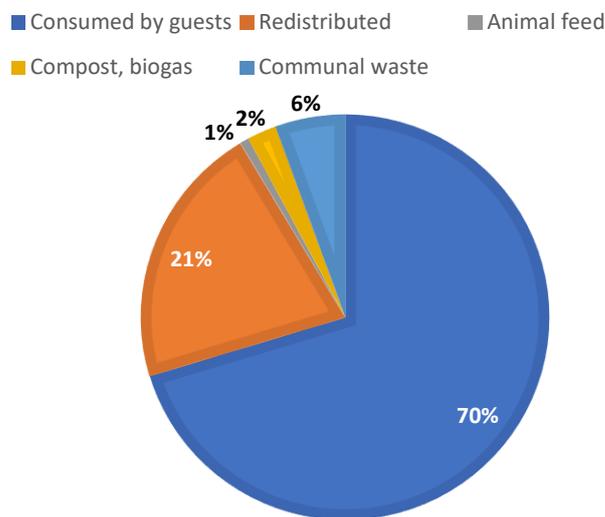


Figure 1 - An example breakdown of the end destinations of food at a "Food Saving Event" in Hungary

## Thoughts for the future

The reduction in food waste is a result of both "reduction" and "redistribution"; the top two levels of the food waste pyramid (Figure 5). At the redistribution level, donation was often crucial for reaching optimal results whereas at the reduction level, the choices made by event organisers were key.

During the project, event organisers were habitual in their choice of service, favouring buffet-style catering as opposed to pre-plated meals which generate less food waste. This shows that changing the habits of event organisers is not easy and requires more time. Event organising agencies also played a key role in the process, both commitment and motivation of event organisers proved crucial to the success of each Food Saving Event. Throughout the project, the motivation of caterers was usually secondary to the motivation of the event organiser, though it was very helpful when the caterer was also highly motivated to reduce food waste.

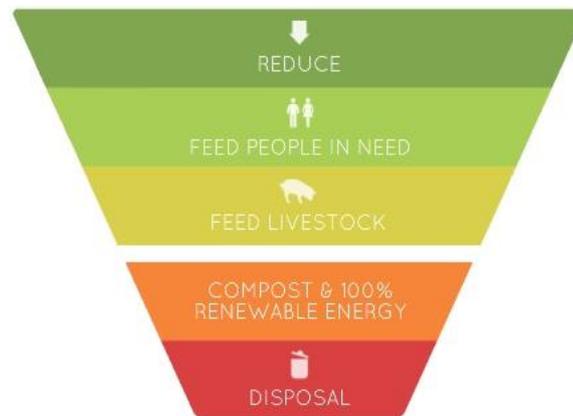


Figure 2 - An illustration of the food waste pyramid

The key difference in event catering, compared to other segments of the HORECA sector, is that the consumer is not the paying customer and so the amount of food ordered is dependent on the choices made by the event organiser and caterer. Nevertheless, informing and involving event guests in food waste reduction efforts was positive and well received.

Overall the project was considered a success and it is anticipated that the concept will be developed further after REFRESH. There are already events planning to operate as Food Saving Events in 2019 with event organisers and agencies showing considerable interest in the application of the guideline.



## Broadening the bridge

### Overview

#### The need

In Hungary, the amount of surplus food offered by companies as a donation has increased from 4500 to 11000 tonnes over the past 2 years and is predicted to continue to increase [1]. However, it is becoming more and more difficult to increase the volume of food surplus redistribution to people in need. The main barrier is the capacity limit of the redistribution channel, particularly the financial and human resources of food banks and partner organisations.

#### The solution

Increased efficiency of existing food surplus redistribution channels was achieved by collaboration between public, private and NGO stakeholders. A cost model of the projected volume of food redistribution over the next 5 years identified a gap in funding.

#### The benefit

Food surplus redistribution increased by 144% and a model has been created for using FEAD funding to cover the costs of food surplus redistribution.

Increasing channel capacities in food surplus redistribution in Hungary, by establishing local public-private-NGO collaboration and securing additional funding.

The project was co-managed by the Hungarian Food Bank Association (HFBA), the biggest food surplus redistribution organisation in Hungary, and the Hungarian Ministry of Human Capacities (HMHC). The HMHC is responsible for all social affairs in Hungary, including the strategic management of social care networks, and management of the Hungarian operational program of the Fund for European Aid to the Most Deprived (FEAD).

### Background

Food waste is becoming a central topic on the political agenda of many countries across the EU. In recent years, more and more companies from the food chain have started to donate their edible surplus food to food banks. Food banks are often considered to be “unlimited capacity” organisations, however, the capacity of a food bank is determined by available human resources and the amount of financial donations it receives.

Food banks, and partner organisations taking part in the redistribution process, offer food free of charge to people in need, therefore the cost of redistribution has to be externally financed. Financing is usually based on donations from private and public sources, but financial donations are often a fixed amount and do not increase in line with the overall volume of food that a food bank receives.

Food surplus redistribution is also labour-intensive and relies heavily on the work of volunteers. Despite the low salary costs, the number of volunteers at any one time changes frequently and this makes it difficult to assess the number of people that are required for given tasks which, in itself, can be a barrier to sourcing additional funding.

The lack of consistent financial and human resources means that food surplus redistribution can be delayed and inefficient. In Hungary, it has been suggested that if human and financial resources at food banks and its partner organisations do not increase, there will be a food surplus



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*“Food waste is one of the main concerns of modern society. It is positively imperative that we support initiatives aiming to redistribute food surplus and we are presently working on a feasible funding scheme. One good example is the Hungarian Food Bank Association that works to make surplus food available for people in need.”*

*Attila FÜLÖP - State Secretary for Social Affairs and Social Inclusion, Ministry of Human Capacities*

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bottleneck. Until now, the financial implications of this bottleneck had not been assessed.

### **What was the solution?**

The first objective of the project was to analyse the “redistribution supply chain” and assess existing resource capacity of food banks, redistribution partner organisations, and local stakeholders. Once the resource capacity of existing sources was identified, any additional financial requirements were calculated. The secondary objective was to cost model additional financial requirements over the next 5 years so that projected food surplus redistribution demands are met. The financial modelling was also used to assess the feasibility of using additional funding sources for food surplus redistribution; including the use of EU FEAD funding.

### **Implementation and outcomes**

The first part of the project involved analysis of existing and potential redistribution resources, primarily logistics capacities and human resources required to run the redistribution activities. A key finding of the analysis was the identification of 11 “white spots”. White spots are cities where food surplus has been offered in the past, but no organisation could be found to run the redistribution activities. One example in Hungary was the city of Paks, and so new food redistribution channels were established by creating a new cooperation among the local municipality, the public social care organisation

and local NGOs. None of these organisations were capable of establishing the redistribution chain on its own, but with the help of sharing resources (transportation, storage, human resources) a cooperative action could be started. The redistribution work in Paks was successful, saving on average 3500 kg food monthly and helping 800 people on a regular basis.

In addition, to meet food surplus redistribution demands, the first food bank outside Budapest was established in Debrecen, which is covering redistribution activities in the whole Hajdú-Bihar county. The food bank has 15 volunteers and provides on average 10,000 kg of food to 3,000 people on a monthly basis (Figure 1).



*Figure 1 - Food ready to be redistributed as part of the redistribution capacity building project*

As part of the project, workshops and interviews were held with experts from the social domain, both from the public and NGO side in 2 selected regions (Gödöllő, Miskolc). The workshops were aimed at collecting best practices in cooperations among the different stakeholders participating in the redistribution process with a view to understand the activities and resources of the public social care system, especially focusing on the potential integration of those into the redistribution activities. The best practices and knowledge collected from these workshops was also used in other parts of Hungary to create similar cooperations among the local redistribution actors and stakeholders (municipalities, social care organisations, NGOs).

The cost model of redistribution showed a 1:14 multiplication factor. This means that for every €1 of funding, €14 worth of food could be redistributed to people in need. This demonstrated that if FEAD funding were to be used in the redistribution process, there would be a high cost-benefit ratio.

The results of this project formed the basis for a funding proposal to the Hungarian Ministry. Based on the proposal The Hungarian Ministry for Human Capacity is currently planning to fund food redistribution activities in 2021-2027 using part of FEAD sources. Redistribution activities increased in Hungary by 144 % during the project, partly because of the knowledge transfer of the new learnings in the project.

## Thoughts for the future

This project sits at the cross-section of the food waste domain where environmental and social interests are fully matching, and a public-private-NGO cooperation is fully possible. The knowledge and networks of the Ministry in the social care domain could be well matched with the network of the Food Bank in cooperation with donor companies. As such this had a huge



impact on the success of the project and future projects would do well to ensure the possibility of full cooperation between all actors.

There is a substantial amount of potential resources that are currently underutilised within the food redistribution chain. These resources can be used to their full potential through more effective cooperation between stakeholders, especially at a local level. Public-private-NGO cooperation was highly effective and mutually beneficial, but the initial set-up takes significant time and energy.

The project highlighted that even if extra resources are fully utilised in existing channels, the capacity limits still exist, and so it is critical that extra financial funds are raised to meet food surplus redistribution demands.

Finally, the cost model demonstrated that usage of FEAD funds is a logical and feasible solution, with a high cost-benefit ratio.

Overall, redistribution activities in Hungary increased by 144 % during the project, with new local food banks in other Hungarian counties also in planning stage.

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*"We are very happy to see food surplus donations increasing and more and more food companies willing to join the Food Bank's network. Although we see strong limits in our capacities, thanks to the project we also see now the possibilities of the future development of our activities"*

Balázs Cseh, president of the Hungarian Food Bank Association

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## Overview

### The need

It is estimated that 1.8 million tonnes of food is wasted each year in Hungary [1]. Furthermore, despite the increased desire for healthy food, estimates of food waste occurring at pre-consumption stages remain high [2].

### The solution

Through REFRESH two projects were developed to 1) sell “imperfect” fruit and vegetables through retail channels, and 2) redistribute surplus fruit and vegetables through donations from wholesalers to food banks.

### The benefit

The projects resulted in a reduction in food waste and increased the amount of food waste being diverted from less preferable waste management options to redistribution; providing highly nutritional food for people with low incomes.

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## Ugly but tasty

REFRESH project promotes the sale and redistribution of “Perfectly Imperfect” fruit and vegetables in Hungary

The “Ugly but tasty” REFRESH project consists of two parts. The first part involved cooperation between the Hungarian Food Bank Association (HFBA) and TESCO Hungary. The second part was led by the HFBA in cooperation with the Budapest Wholesale Market (BWM). Both TESCO and the BWM are responsible for the sale of a variety of food products.

TESCO is a multinational food retail company with a strong presence in Central-Europe. They have more than 200 stores in Hungary, which combined serve approximately 3 million customers per week. In contrast, the BWM is the largest wholesale market in Hungary. The products offered by growers and wholesalers meet the demands of retailers six days a week. Fresh vegetables and fruits, mushrooms, eggs, honey, canned products, preserved food, sweets and refreshments can be purchased here throughout the year.

## Background

Whilst direct measurements of food waste are not typically made across the supply chain in Hungary, it has been estimated that 1,8 million tonnes of food is wasted each year [3]. A significant proportion of this is expected to result from strict marketing standards which inhibit the sale of “imperfect” produce. Typically, this is due to quality reasons but in many cases products that are still fit for human consumption are sent to less preferable waste management options; such as animal feed, biomass or landfill. However, the number of projects addressing this food waste issue is still relatively low.

TESCO recognised this as a problem and in 2013 they started selling “Imperfect” fruit and vegetables within UK stores. As an organisation they are committed to tackling food waste. In Central Europe for example,



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*“We have a strong commitment to decrease food waste therefore we are measuring and taking actions in our daily operations and we are very glad our customers are also supporting our goals by participating in our program by buying Perfectly Imperfect fruit and vegetables”*

– *Nóra Hevesi – Head of Communications and Campaigns at TESCO Hungary.*

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TESCO became the first retailer to publish food waste data from their own operations. In addition, TESCO recently launched a Food Waste Hotline in Central Europe, which enables suppliers to communicate to TESCO about potential areas of food waste in the supply chain so that they can work with TESCO to address them.

Like TESCO, BWM is also very concerned about food waste and include the issue within their corporate social responsibility. Their focus has been to concentrate primarily on the free redistribution of unsold products in cooperation with the HFBA.

### **What was the solution?**

Through REFRESH a two-part project was developed which aimed to take a “farm to fork” approach to food waste related activities in the fruit & vegetable sector. It was felt that the benefit of choosing this sector was that it has one of the shortest supply chains as it doesn’t include an industrial processing stage. The project focussed on lower quality products such as apples and carrots, to find possible channels for marketed (discounted sale) and non-marketed (free redistribution) surplus food.

The first part of the project focussed on ways to market surplus food. Following successful UK sales, in 2017, TESCO launched their “Perfectly Imperfect” campaign across their stores in Hungary. “Perfectly Imperfect” fruit and vegetables have “visual flaws” such as deformations or discolorations. Raising awareness and changing perception can help to convince consumers that taste is unaffected by visual defects. “Perfectly Imperfect” apples, carrots, avocados, garlic and potatoes were sold in stores throughout the year whilst cucumbers, pears, limes, California paprika and sweet potatoes were sold seasonally. In addition, TESCO also decided to increase the number of their stores which offered food surplus donations; in line with their target for all Central European stores to offer food surplus donations by 2020.

The second part of the project focussed on ways to redistribute surplus food at the Budapest Wholesale Market. Producers and wholesalers were approached



and offered an easy way to donate their unsaleable, but edible, surplus food. Donations were channelled into the redistribution network of the HFBA.

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*"Sustainability is an important issue for the Budapest Wholesale Market. We are glad we can cooperate with the Hungarian Food Bank Association in reducing food waste by offering an easy donation option for our partners who are the biggest Hungarian fruit and vegetable producers, wholesalers and retailers!"*

—Zoltán Klucsik, Development Director of the Budapest Wholesale Market

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## Implementation

In 2016, TESCO's purchasing department selected initial suppliers for their "Perfectly Imperfect" product line in Hungary. Once the suppliers had been selected, TESCO developed and ran marketing and communication activities (Figure 1) aimed towards customers to promote their upcoming product line; launching the "Perfectly Imperfect" range (Figure 2) across Hungary in January 2017. Throughout 2017 and 2018 TESCO continued to evaluate their food waste, sales and customer feedback via internal audits and consumer research activities.



Figure 1 - A communication campaign used by TESCO to highlight their new "Perfectly Imperfect" product range



Figure 2 - "Perfectly Imperfect" bagged carrots to be sold in TESCO Hungary stores

At the BWM a tempered container (Figures 3 and 4) was installed at a new food surplus collection point in June 2017. Producers and wholesalers were approached via the BWM electronic newsletter and by personal visits at the market to inform them about the new food surplus collection point. Promotion of the redistribution activity was also carried out during events organised by BWM (e.g. [the Night of the Market](#)). Donations were measured and documented, and the container was emptied each day when surplus was offered, and the contents donated to the Hungarian Food Bank Association.



Figure 3 - The tempered container used to store surplus food at the Budapest Wholesale Market



Figure 4 - Surplus food inside the tempered container, ready for redistribution

## Outcomes

Throughout 2017 and 2018, “Perfectly Imperfect” products were offered across 112 TESCO stores in Hungary. In total, this prevented 2,900 tonnes of edible food from being unnecessarily discarded. In addition to the sale of “Perfectly Imperfect” products TESCO continued to redistribute unsold food to the Hungarian Food Bank Association. In total TESCO donated 7364 tonnes of fruit and vegetable food surplus from its Hungarian stores during 2017/2018.

Following the implementation of the tempered container, the BWM collected about 40,000 kg for redistribution (between June 2017 and March 2018). Donations were distributed to 150,000 people in need in Hungary by the network of the Hungarian Food Bank Association.

Both projects were successful, and communication of the activities increased general awareness about the issue of food waste in Hungary.

## Thoughts for the future

The inclusion of a “Perfectly Imperfect” fruit and vegetable range in TESCOs stores shows these products are well accepted by Hungarian customers and suppliers are interested and willing to cooperate long-term in providing products at a discounted price.

In relation to the redistribution activities, it should be recognised that whilst involvement of new donors among fruit and vegetable producers and retailers in the redistribution activities was successful, it is a slow process and requires significant



time and effort. Nevertheless, feedback from recipients of food donations was very positive and the high nutritional value of the products is improving the lives of people in need.

Both TESCO and BWM plan to continue their activities beyond REFRESH. TESCO is willing to continue the sales of their “Perfectly Imperfect” product line, whilst BWM continue to use the tempered container to redistribute food and are planning to maintain and develop their redistribution activities.

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## 5 Spain



# Valorisation of food surpluses and side-flows and citizens' understanding

## Overview

### The need

In the last few years, several innovative valorisation processes have been developed in different countries to prevent and reduce food waste. However, little is known about consumers' acceptance of the end products resulting from these innovations.

### The solution

A social experiment was carried out in Barcelona in the context of parents' choices of their children's school meals. They were tested to determine whether they would accept feeding their children with valorised foods from food surpluses or side-flows.

### The benefit

The relevant factors that influence the acceptance or rejection of valorised foods were identified. These factors include familiarity, knowledge, perceived risks, perceived benefits, experiences of food processes, involvement, trust between consumers and producers, information, naturalness, local origin, levels of processing, trust in food regulatory institutions, sustainability, safety, complexity, moral considerations, traceability, and transparency.

Consumer understanding and acceptance of different valorisation methods for food surpluses and side-flows were investigated. Of interest was the extent to which consumers accept and even appreciate products resulting from innovative waste valorisation processes. The requirements were identified for Spaniards to accept the use of valorised products.

## Background

One third (1,300 million tons per year) of the food produced in the world for human consumption is lost or wasted [1]. In the EU, about 88 million tons of food is wasted per year (20% of all food produced), which is equivalent to economic losses amounting to around 143,000 million euros [2]. In addition to the economic losses (losing the food itself, and the cost of waste treatment), other impacts include large losses that are generated in natural resources (stress on the use of water, land, energy, labour and capital), social repercussions (price increases), and greenhouse gas emissions [3].

In addition to the need to adapt a sustainable production system and eating practices [4], the use of food surpluses or side-flows from the original food supply chain as valorised foods, ingredient or feeds may be part of the solution; however, it is subject to consumer's acceptance of the valorised foods. In this context, a previous study [5] suggested that consumers are not familiar with valorised foods and they may perceive them as unhealthy. Indeed, consumers are increasingly interested in sustainability, but also in food safety and quality [5].



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*"We carried out a social experiment where we used a participatory approach to assess citizens' perceptions of valorised food from food surpluses or side-flows. The experiment was successfully done, and we were able to identify the relevant requirements for Spaniards to accept the use of valorised products."*

*—Dr. Djamel Rahmani Post-doc  
researcher at CREDA-UPC-  
IRTA*

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## What was the solution?

CREDA assessed consumers' and citizens' perceptions of valorised foods from food surpluses or side-flows. The aim was to identify the relevant factors that influence the acceptance of valorised foods. To do this, CREDA carried out a social experiment in Barcelona where parents were tested to determine whether they would accept feeding their children with valorised foods from food surpluses or side-flows.

The social experiment was carried out in Barcelona in the context of parents' choices of their children's school meals. A group of parents were tested to determine whether they would be open to their Council favouring catering companies that integrate valorised foods from food surpluses or side-flows when hiring school catering services. In particular, parents' perceptions of valorised food from four different valorisation processes were assessed: (i) gleaning vegetables and converting them into foods such as soups or creams; (ii) extracting ingredients (vitamins) from product surpluses and using them for food enrichment; (iii) converting food-processing by-products to feed and feed supplements for animals intended for human consumption; and (iv) converting catering food surpluses to liquid feeds for pigs intended for human consumption (currently banned in the EU).

## Implementation

The experiment was carried out in collaboration with the Regional Council of Vallès Oriental (Barcelona). The experiment combined a citizens' jury (participatory method) and a hypothetical discrete choice experiment (DCE: a stated-preference method) that was applied in the context of parents' choices about school menus. A group of 24 parents listened to expert talks about production processes of different valorised foods from food surpluses and side-flows and chose the hypothetical menus suitable for school catering services. The school menus (Figure 1) consist of a three-course meal (a starter, a main meal, and a dessert) as is usual in Spain.

The experiment was carried out in May 2018, in two sessions with a ten-day interval. Parents were required to choose the meal menu they would buy for their children in twelve days (choice occasions). The first session was held on May 3 and lasted three hours (4:30pm to 7:30pm). Parents attended an informative session, discussed the issues in a plenary session, answered individually the DCE questions, and voted collectively on the DCE questions. The second session was held on May 14 and lasted



two hours (5:00pm to 7:00pm). Parents answered individually the DCE questions, participated in the workshop (pros and cons), and voted collectively on the DCE questions.

*Reminder: please remember that if you do not like any of the three menus or the prices seem very high, you should choose the "None" option.*

C.1. which of the menus, shown here, would you buy for your child?

	Menu A	Menu B	Menu C	None							
Starter	Conventional pumpkin cream	Valorised pumpkin cream	Conventional pumpkin cream	None of the three menus							
Main course	A pork steak fed with conventional feeds	A pork steak fed with by-product feeds	A pork steak fed with ecofeeds								
Dessert	Valorised Yogurt	Yogurt conventional	Valorised yogurt								
Price	€7 per day (€154 per month)	€5 per day (€110 per month)	€4 per day (€88 per month)								
<i>I buy:</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>							
<i>Please, how certain you are about your choice?</i>											
<i>Totally uncertain</i>				<i>Totally certain</i>							
	0	1	2	3	4	5	6	7	8	9	10
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 1 – The three school meals used in the projects choice experiment.

Parents were also invited to participate in a workshop where they discussed the pros and cons of each of the considered valorisations methods (Figure 2).

*"Our participants identified the pros and cons of each of the different innovative valorisation methods. We are pleased to contribute to better understanding of consumers' and citizens' perceptions of foods resulting from innovative valorisation methods of food surpluses or side-flows."*

*—Dr. Djamel Rahmani Post-doc researcher at CREDA-UPC-IRTA*



Figure 2 - A small group of parents debating the pros and cons of the methods.

## Outcomes

The identified relevant factors that influence the acceptance or rejection of valorised foods were familiarity, knowledge, perceived risks, perceived benefits, experiences of food processes, involvement, trust between consumers and producers, information,



naturalness, local origin, levels of processing, trust in food regulatory institutions, sustainability, safety, complexity, moral considerations, traceability, and transparency.

A remarkable result from the study is that although gleaning-based valorised products were deemed acceptable to be used within the setting of school lunches, the other valorisation methods were not. However, the participants did not view them as unsuitable for adult consumption. In contrast to their stated perception of valorised products as safe for health, presented with the option of giving these products to their children evoked a negative response ('just in case'...).

Based on the evidence from the experiments performed in the study, we find that informational strategies can contribute to the acceptance of valorised products by consumers.

## Thoughts for the future

The findings of this study are based on a very specific sample, which is not representative of the Spanish population (overrepresentation of women, specific age cohort, etc.). Any results regarding trust towards stakeholders, including governmental and regulatory institutions may be influenced by the current political situation in Catalonia, but we cannot attribute its extent. Additionally, the purchasing intentions for valorised food behaviours of the studied group may differ from those of the rest of Spain or other European countries. Therefore, we recommend further research to investigate these preliminary results in the context of other settings and EU Member States.

Finally, in the present experiment public purchasing intentions for hypothetical valorised food products were assessed. However, sensory factors might also influence the acceptance for valorised food and could be studied in future research, including consumer taste and texture appreciation in experimental settings or action-based pilot studies using existing valorised food products.

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*"Our participants perceived foods resulting from food surpluses or side-flows as safe for health, however, when they were presented with the option of giving these products to their children, this evoked a negative response."*

*—Dr. Djamel Rahmani Post-doc  
researcher at CREDA-UPC-IRTA*

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If you would like to know more about the project, further information can be found within the [REFRESH Work Package 1.7 report](#) [6].



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## Overview

### The need

Gastrofira is increasingly aware of the environmental and social impact of the food system. As such, they are committed to offering more sustainable catering services for their clients.

### The solution

Gastrofira analysed two different types of food service, at two trade fairs in Spain (one international, one national). The analysis involved: 1) establishing baseline food waste levels, 2) identifying potential interventions to reduce food waste, 3) implementing the interventions, and finally 4) measuring the impact of the interventions.

### The benefit

Although it's difficult to ascertain the true impact of each intervention, there were significant reductions in food waste at the trade fairs following implementation. Furthermore, this project has started a process of food waste monitoring and prevention that could be replicated by other catering companies in the future.

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# Reducing food waste at trade fairs in Spain: The impact of interventions implemented by Gastrofira

Food waste reduction interventions significantly decrease food waste across four trade fairs in Spain

Gastrofira is the catering service of the Fira de Barcelona, one of the major trade fair institutions in Europe. They provide catering services for corporate events in both small- and large-scale venues, and offer a wide range of menus, including: coffee breaks, fingers menus, gala dinners and cocktails.

## Background

The importance of tourism for the Spanish economy, and the nature of big events (trade fairs) - namely an inclination for a certain degree of opulence and the prevalence of a “use and throw away” culture - are of high concern in the fight against food waste in Spain.

Gastrofira, are aware of the potential environmental impacts associated with the different catering services they offer, and are committed to finding more sustainable alternatives for their clients who are willing to accept them. This action aligns with the “Action Plan Gastrofira”, implemented to enhance Gastrofira’s environmental performance: *Plan de Sostenibilidad de Gastrofira “¿Serlo o parecerlo?”* (Sustainability plan of Gastrofira, to be or to appear to be). It was in this context that Gastrofira was interested, firstly, in becoming a member of the REFRESH Spanish Pilot Working Platform and, secondly, in deciding to participate with a pilot project.

Prior to REFRESH, Gastrofira had already been involved in the fight against food waste; helping to evaluate the environmental impact of previous fairs and working



collaboratively with a local NGO (Nutrition without borders) to redistribute surplus food to those in need. Being part of REFRESH has served to reinforce their effort to tackle the issue of food waste.

## What was the solution?

The REFRESH Spanish Platform had established the hospitality sector as a priority sector for food waste reduction in Spain. Therefore, following meetings between Gastrofira and CREDA (Centre De Recerca En Economia I Desenvolupament Agroalimentari) a two-year project to tackle food waste in this sector was defined. The objective of the project was to evaluate the food waste situation in two types of food services offered by Gastrofira, and to establish potential solutions to prevent and reduce food waste.

The services (Table 1) were offered at two different fairs in 2017 to:

1. Establish baseline food waste levels
2. Determine causes of food waste
3. Propose appropriate interventions which may lead to food waste reductions

The services were then offered at the same fairs the following year, where the interventions were now implemented. Measurements could then provide an indication of the impact of adopting these interventions.

*Table 1 - The two types of service offered and evaluated*

	Service A	Service B
<b>Two types of service</b>	3 dining-rooms ~ 2000 diners per day International fair Finger menu	1 dining-rooms ~ 200 diners per day National fair Buffet menu
<b>2 years</b>	Baseline 2017 Intervention 2018	Baseline 2017 Intervention 2018

The manager of Gastrofira was engaged and committed throughout the project and provided all the internal resources and personnel necessary to facilitate both the baseline quantifications and the implementation of interventions.

## Implementation

Following project design, two fairs were selected, in which the two different food services could be provided and analysed. Using various approaches, members of CREDA then quantified the amount of food waste produced at each of these different stages (Figure 1). Measurements represented food waste over the entire length of the fair and the same approaches were adopted in 2017 and 2018, to make sure results were consistent and comparable.

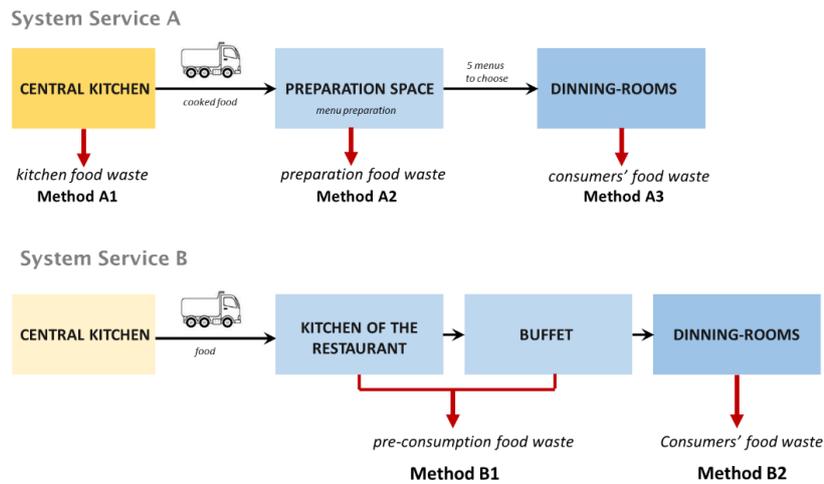


Figure 1 - A diagram of the two different food offers and expected areas of food waste along the chain

### Food waste monitoring methods (Figure 1):

- **Method A1:** Participant observation and direct weighing with scales. 2 people, visiting the central kitchen twice per day during 11 consecutive days (preparation of food and during the fair). At the end of the day trash bins were weighed to quantify kitchen food waste. Other secondary data was used, such as food purchasing or production. During 2018 kitchen waste was excluded from the scope.
- **Method A2:** Participant observation and estimation based on data provided by Gastrofira. Uses the number of menus prepared and the weight of each menu based on observation and chef's knowledge.
- **Method A3:** Food waste from consumers was collected in trash bins together with other materials (napkins, paper and plastic dishes). At the end of the service, all trash bags were weighed and 20% of the bags were opened. From these opened bags, food waste was sorted from the other materials. Food waste per day was estimated based on the bags that were sampled.
- **Method B1:** Participant observation and estimations based on direct weight and information from chefs. All the food prepared and exposed in the buffet line was estimated.
- **Method B2:** Consumers' leftovers were collected by waitresses and sorted into trash bins. At the end of the service the research team weighed all the trash bins which contained only food waste.

Following measurements made in 2017, Gastrofira worked with CREDA to establish which interventions (both pre-consumption and consumer level) were likely to be most impactful in reducing food waste. The interventions were then implemented at both fairs in 2018. Food waste measurements were then taken once again at each of the listed stages.

## Outcomes

### Service A

In 2017, 7,332 diners attended the international fair. For each person that attended the event there was an estimated 407.6 grams (Table 2) of food waste (305 grams/per capita from preparation and 102.6 grams/per capita from consumers plates). Observations on expected causes of food waste included:



- Central kitchen food waste
  - Mainly leftovers from preparation
  - Mostly inedible food (lemon peels, etc.)
  - However, most of the food was either semi-prepared or pre-prepared food, therefore there wasn't much preparation food waste
- Preparation space food waste (a separate space where meals were prepared, outside of the kitchen)
  - High amounts of food waste due to high security margins, and imbalances in the number of expected clients and the number of actual clients
  - Avoidable food waste
  - Limited food waste due to preparation
  - Very short expiration dates of surplus food and cold chain guarantee
- Dining room food waste
  - Leftovers from clients
  - Avoidable food waste
  - No fixed pattern observed in clients (some of them left desserts whilst others left a little amount of food across multiple dishes)
  - 5 fixed menus with no variation possible (4 days of fair)

The interventions highlighted to tackle these issues included:

- 5% reduction of the security margin from pre-booked diners
- Reduction from 5 dishes per menu to 4 dishes per menu maintaining the weight of the menu
- Digitalisation of the food order system for the kitchen



Figure 2 – Images of dishes offered in Service A, the left image represents five dishes from the Japanese menu in 2017, whilst the right image represents four dishes from the Japanese menu in 2018.

In 2018, following the interventions, there was a clear impact on levels of food waste at the international fair. There was almost a 50% reduction of preparation space food waste per capita and 14% reduction in the consumers' food waste per capita (Table 2). However, the reduction in preparation food waste cannot be fully explained by reductions in security margins, as there was likely a combination of influential factors. For example, in 2018 the booking clients pre-booked 8% less dinners.



In addition to the designed reduction in number of dishes per menu (from 5 to 4) other unknown factors may have influenced consumers' food waste from the dining room. Nevertheless, it seems there was still substantial reductions in consumer food waste per capita, from 102 grams per capita in 2017, to 88 grams in 2018 (Table 2).

Table 2 – Food waste figures for the international fair (Service A), separated into preparation space food waste and dining-room food waste

PREPARATION SPACE				
	2017	2018	2018-2017	
Total diners	7,332	7,793	461	6%
	(grams)	(grams)	(grams)	% reduction/over 2017
Food waste preparation space per capita	305	136.8	-168.3	-55%
DINING-ROOM SPACE				
	2017	2018	2018-2017	
	(grams)	(grams)	(grams)	% reduction /over 2017
Food waste dining-room per capita	102.6	88.6	-14	-14%

## Service B

In 2017, the estimated food waste per capita of clients attending the national fair was 438 grams (Table 3). It was anticipated the causes of this food waste were:

- Pre-consumption food waste
  - Overproduction due to imbalance of expected clients and actual clients
  - Expiration date of certain food products
  - On the last day of the fair there was more food waste
- Consumers food waste
  - Little food waste observed per capita. The buffet system could have had an influence. First course (salads, cold meat, etc.) exposed in small dishes and clients took the main course after eating the starters. Main course served by Gastrofira's waitresses.
  - Garnish food waste

The interventions highlighted to tackle these issues included:

- Re-adjusting the cooking to the actual number of clients each day, to avoid preparing too much food
- Adjusting food quantities to meet the expected number of clients
- Using different food waste reduction messages on the tables at the buffet line (Figure 3)
- Providing leaflets at the buffet line (Figure 4) to:
  - Inform about food waste prevention actions from Gastrofira
  - Increase food waste awareness



Figure 3 - Food waste reduction messages used on the buffet line - the left reads "Choose with moderation" and the right reads "Share with your colleague if you don't want so much"



Figure 4 - The food waste reduction leaflet provided at the buffet line for Service B

In 2018, following the interventions, the national fair exhibited a 22% reduction of food waste per capita (Table 3). This reduction was anticipated to be due to pre-consumption interventions, as the consumer food waste actually increased from 61 grams/capita in 2017 to 75 grams/capita in 2018. It was therefore expected that the leaflets supplied had little impact on food waste levels. However, as previously highlighted the food waste was mainly from garnish, so it would be interesting to test the same strategy on other types of service (e.g. Service A).



Table 3 – Food waste figures for the national fair (Service B), separated into pre-consumer and consumer food waste

<b>DINING-ROOM</b>				
Food intake	335,100	359000	<b>23,900</b>	7%
Total number of clients	585	567	<b>-18</b>	-3%
<b>Consumer food waste</b>	<b>35,400</b>	<b>43000</b>	<b>7,600</b>	21%
<b>Consumer food waste per capita</b>	<b>61</b>	<b>75.8</b>	<b>15</b>	25%
<b>Pre-consumer food waste per capita</b>	<b>378</b>	<b>267.9</b>	<b>-110</b>	-29%
<b>Total food waste</b>	<b>256,400</b>	<b>194,900</b>	<b>-61,500</b>	-24%
<b>Total food waste per capita</b>	<b>438</b>	<b>344</b>	<b>-95</b>	-22%

## Thoughts for the future

Gastrofira are committed to continue food waste reduction. They will work on:

- Improving the design of the gastronomic offer to minimize food surplus. The improvements must be attractive to consumers and must satisfy all kind of clients (vegans, vegetarians, kosher, halal, gluten free, lactose free, etc.).
- Working with direct clients (the company not the end consumer) on pre-orders, based on historic data of final clients attending pre-ordered lunches.
- Working to avoid absenteeism of attendees booked at restaurants, to avoid food surplus from cooked menus.
- Exploring new redistribution channels for surplus food. The first option is for workers' lunches, the second is to work with Nutrition without Borders NGO. There are also other options being explored.
- Detecting the recipes that are most frequently rejected by diners and that are often wasted, to change the offer or the recipe.

In conclusion, the Gastrofira pilot project has complied with their objectives. Food waste from a large trade fair event has been quantified, demonstrating that no matter the size of an event, a protocol for quantifying food waste and identifying improvements can be created. Moreover, the project provides useful insights for other catering services attempting to quantify food waste in their own operations.

The project showed that small changes can lead to significant reductions in food waste. However, not all prevention strategies appeared successful. It is also important to recognise that this project only tested two different food service offers and further testing (in different contexts) is required to assess potential food waste reductions associated with the interventions.



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## Overview

### The need

Quantifying food loss and waste (FLW) and its causes allows for more targeted and effective food waste interventions. Moreover, to effectively meet targets a good understanding of the current FLW situation is essential.

In the region of Catalonia, in Spain, the public company that has competencies over the waste generated and managed (the Waste Agency of Catalonia [ARC]), recognise the need to quantify the current FLW situation.

### The solution

Following a 2016 study, promoted by ARC, workshops identified the peaches and nectarines (PN) sector as a good starting point to carry out whole supply chain FLW quantification. ARC hired the Center for Agro-Food Economy and Development (CREDA-UPC-IRTA) to implement the quantification, which was carried out between September and December 2017. The quantification analysed FLW across a number of different lifecycle stages of the PN supply chain.

### The benefit

The project highlighted the causes and areas of FLW across the PN supply chain and proposed seven targetted food waste reduction objectives as a result. These included, for example, increasing knowledge and awareness of FLW along the supply chain and promoting transparency and traceability of FLW.

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# Food waste along the food supply chain: A case study of Spanish peaches and nectarines

REFRESH project quantifies supply chain food loss and waste (FLW) of peaches and nectarines (PN) in Catalonia

In Spain, both waste and food-related competencies are transferred to the Autonomous Communities. In Catalonia, the Waste Agency of Catalonia (ARC-Agència de Residus de Catalunya) is the public company that has competencies over the waste generated and how it is managed. Two of ARC's main objectives are to promote the minimisation of waste and reduce its environmental risk.

## Background

In Catalonia, there is a programme titled "The Catalan General Waste and Resource Management and Prevention Programme 2013-2020" (PRECAT20) which encourages waste reduction across all sectors.

Two objectives included in PRECAT20 are:

- 4b.1. Halving food waste from 2010 levels by 2020 in retail, hospitality and households**
- 4b.2. Establishing, by the end of 2018, food waste reduction objectives for the primary and agri-food sectors, as well as wholesale distribution**

In attempts to meet these objectives, ARC has been heavily involved in numerous projects, including: consumer campaigns, improvements to food waste measurement, preparation of food waste reduction action plans and the subsidising of prevention projects for local authorities and non-profit organisations. Notably, in 2016, ARC promoted a methodological



protocol to quantifying food waste in the primary sector, agri-food industry and wholesale sector in Catalonia. The study included, amongst other exercises, participation (workshops) from food sector stakeholders, who identified the potential sectors in which food waste could start to be quantified.

## What was the solution?

One sector that was highlighted during the workshops was the fruit sector. In particular, peaches and nectarines (PN) were listed as a good starting point to carry out whole supply chain food loss and waste (FLW) quantification. PN were selected due to four criteria:

- **Production:** The fruit sector represents 42% of primary production and 10% of the cultivated land used for human consumption in Catalonia. PN represent 44% of total fresh fruit production and also represent the largest proportion of fruit and vegetable exports.
- **Economic:** The fresh fruit sector represents around 40% of final primary production in Catalonia. It is one of the most relevant sectors in terms of economic value.
- **FLW:** PN are highly perishable and consequently there are significant levels of losses and waste.
- **Willingness of the sector:** key stakeholders from the PN sector showed their willingness to collaborate in the quantification.

Following conclusions from the workshops, ARC decided to carry out a FLW quantification for the PN sector, for 2017, in Catalonia. The ARC hired the Center for Agro-Food Economy and Development (CREDA-UPC-IRTA) to implement the quantification, which was carried out between September and December 2017.

The project was made up of two teams:

- A monitoring and evaluation team, responsible for overseeing project progress, which included individuals from the Department of Prevention and Resources Efficiency, and the Subdirectorate General of Food Inspection and Control of the Ministry of Agriculture, Livestock, Fisheries and Food.
- A research team which included a lead researcher and two consultants, all from CREDA.

The main objective of the project was to quantify food losses and food waste across different lifecycle stages in the PN sector, e.g. primary production, retail and wholesale. The secondary objectives were to:

1. Provide a FLW estimate which could be used as a baseline for future food waste interventions
2. Propose potential FLW prevention targets aligned with objective 4b.2 of PRECAT20
3. Identify the main causes of FLW in the analysed stages to propose more targeted waste reduction interventions

## Implementation

Prior to quantification, the scope of the study was determined (Table 1).



Table 1 - The scope of the FLW quantification study

Parameter	Description
The FLW (Food loss and waste) definition employed	FUSIONS definitional framework. Thus food waste was defined as “food and inedible parts of food removed from the food supply chain” to be recovered or disposed (including - composted, crops ploughed in/not harvested, anaerobic digestion, bioenergy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)” (Östergren et al., 2014). As inedible part of fruits, pits of peaches and nectarines were included as food waste.
Vocabulary used	Food waste has a negative overtone in its use in Catalan (malbaratament alimentari equals to food shrinkage) or Spanish (desperdicio alimentario). Therefore, we used a more neutral terminology during the stakeholders’ consultation. Based on previous experience, we used the expression “amount of PN that were managed as waste” for all stages except for the primary production, where it was adapted to “amount of PN left in the field when the fruit was ready to harvest”.
Year	2017
Types of produce	peach, nectarine, flat peach and flat nectarine
Lifecycle stages (Figure 1)	primary production, wholesale at origin, transformation industry, wholesale at destination and redistribution (charity distribution).
Geography	Region of Catalonia
Supply Chain	the main peaches and nectarines supply chain was examined. Thus, alternative production systems and marketing systems, such as organic, agro-ecologic, short-supply chain and, also, the secondary processing industry (jams, cuttings, etc.), were excluded from the analysis. Also, it is important to remark that all PN entering the Catalan PN food supply chain (FSC) at any stage are considered imports, while all PN shipped out of Catalonia at any FSC stage are considered exports.

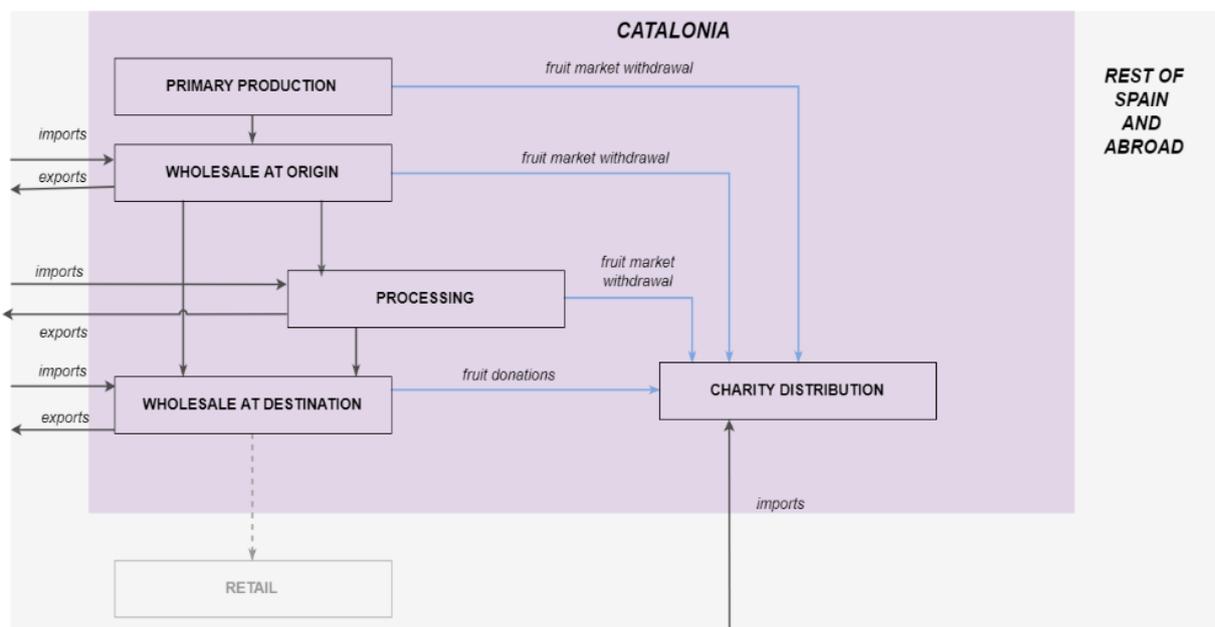
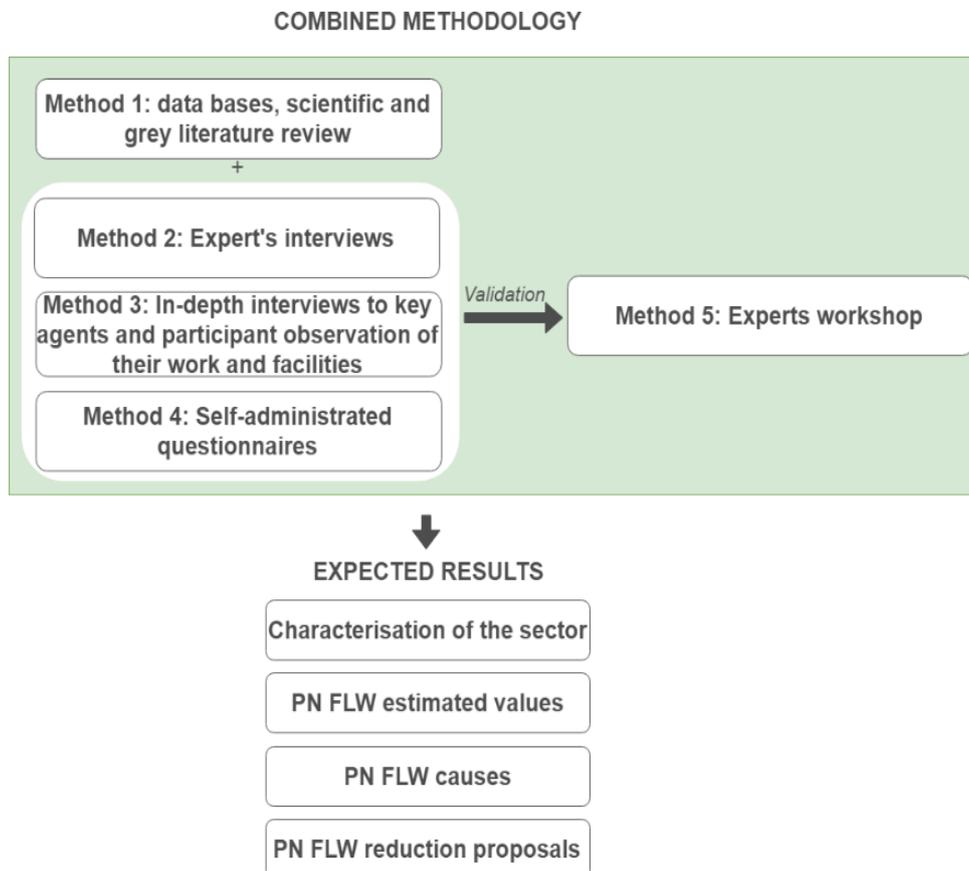


Figure 1 - Peach and nectarine food supply chain stages analysed in the study



In order to quantify PN FLW, a combined methodology was used (Figure 2).



*Figure 2 - Mixed methodology applied to the study*

In particular, five different methods were implemented:

- (i) secondary databases and review of scientific/grey literature to characterize, analyse the sector and get qualitative and quantitative data on PN production;
- (ii) experts' interviews to characterize the sector and its stakeholders, and get qualitative and quantitative information from the PN food supply chain (n=11);
- (iii) in-depth interviews to key agents and participant observation of their work in their facilities of the different FSC stages to obtain direct information on FLW generation, its causes and possible solutions (n=15 companies and organizations representatives from the sector);
- (iv) surveys to gather quantitative information on inputs/outputs and FLW PN volumes according to their origin and destination, and finally (n=15 companies and organizations representatives from the sector);
- (v) "experts workshop" (Figure 3) to validate the results (n=8).



Figure 3 – Experts workshop to validate the results

## Outcomes

The main findings from the study were that PN FLW percentages vary between 1.3% and 8.6% depending on FSC stage. This was mainly due to overproduction and its consequential market saturation (Figure 3). This was characterised by overproduction and an insufficient demand, and led to the perceived value of PN to drastically decrease. In many cases for the primary sector, it was not profitable to harvest the fruits, since the cost was higher than the revenue. Consequently, farmers left part of the harvest in their fields.

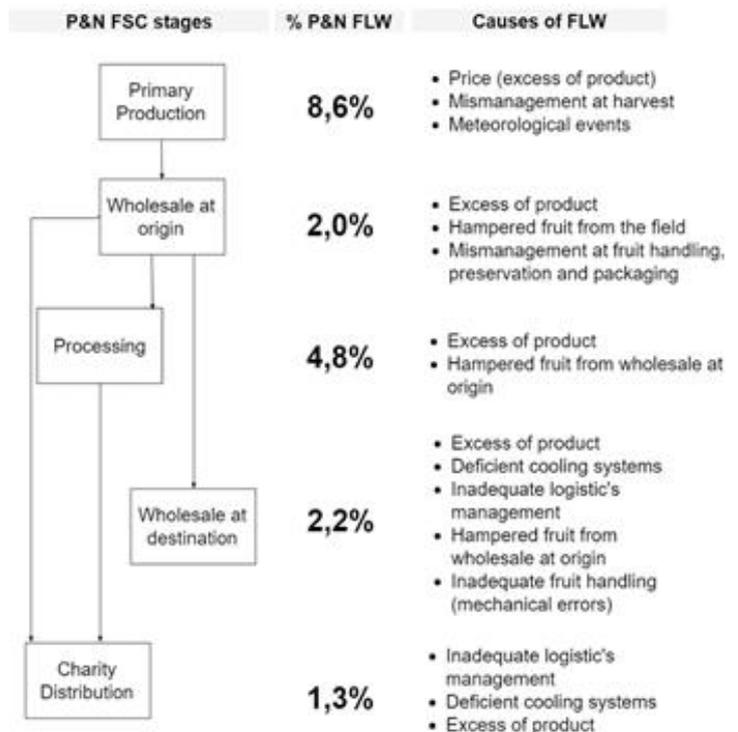


Figure 3 - PN FLW percentages and their main causes per FSC stage



The overproduction situation had consequences in the following stages, since as much harvest as possible was transferred to later stages in the supply chain. This meant that most of the time fruits were in a more hampered state than expected due to long periods stored in previous FSC stages. Moreover, specific actors in the wholesale at destination (stock markets and sales offices) and charity distribution had deficient cooling systems and presented an added difficulty to logistically manage the large amounts of product received, which in many cases were already in an advanced state of ripeness (leading to a shorter shelf life).

In regards to total food loss and waste, this was estimated at 53,317 tonnes (Table 2). However, it should be noted that 2017 was an exceptional year regarding food production, therefore it would be inaccurate to extrapolate findings to other years.

Table 2 – Estimated tonnes and percentage of food loss and waste by lifecycle stage

Stage	Input P&N (t)	Imports (volume and percentage) (t) (%)	Exports (volume and percentage) (t) (%)	Food loss and waste (%)	Food loss and waste volume (t)
Primary production	406,525	0 (0%)	0 (0%)	8.6	34,961
Wholesale trade origin	464,453	92,890 (20%)	340,255 (79%)	2.0	9,140
Transformation Industry	161,611	85,841 (53%)	59,769 (79%)	4.8	7,757
Wholesale trade destination	65,667	42,814 (65%)	-/- <sup>(a)</sup>	2.2	1,445
Redistribution	1,047	36 (3.5%)	-/- <sup>(a)</sup>	1.3	13.6
<b>TOTAL</b>					<b>53,317</b>

<sup>(a)</sup> Exports out of Catalonia not considered in the Wholesale at destination and redistribution as they are out of the scope of the study

## Thoughts for the future

Following analysis, specific objectives to mitigate the current food waste situation in the PN sector were proposed. The seven objectives and their specific tasks were derived from the expert discussions and data evaluation.

**Objective 1: Increase knowledge and awareness regarding food losses and food waste along the food supply chain.**

- 1.1. Food losses and food waste awareness campaigns directed to professional and worker personnel of companies in the agri-food sector
- 1.2. Technical seminars, within PATT (technological dissemination) seminars to increase food sector professionals and disseminate best practices on food waste prevention and reduction



- 1.3. Implement specific courses on food waste to professionals of the agri-food sector to provide them multiple tools and strategies to integrate within companies procedures and policies.
- 1.4. Develop practical guidelines to prevent and reduce FLW

### **Objective 2: Promote transparency and traceability of FLW among all actors of the agri-food chain.**

- 2.1 Periodic studies to know FLW evolution in the PN sector
- 2.2 Promote distinguishing “edible food waste” from the organic food waste in the Waste Catalog, therefore specifying “edible food waste” in the waste statistics (DARIs and DARIGS)
- 2.3 Improve data bases regarding commercialisation volume at each stage of the supply chain, as well as regarding prices, costs, among other values.

### **Objective 3: Increase the value of food.**

- 3.1 Develop campaigns to increase local PN consumption among different sectors of the population. Making emphasis on the specific characteristics of the Catalan fruits such as proximity, the organoleptic properties or the integrated systems of production.
- 3.2 Campaigns at the selling points to increase consumer awareness about the value of food.
- 3.3 Pilot studies on how to incorporate the ecological footprint of fresh fruits, converted into monetary value (€) within supermarkets and food stores which sells local produces in order to increase consumer’s awareness.

### **Objective 4: Promote the improvement of the professional performance of the workforce throughout the food chain.**

- 4.1 Training days to improve the professionalization of the workforce in the sector (especially those in direct contact with fruit manipulation such as harvesting, handling, packaging etc. Consider the collaboration of the sector (associations, labour unions, etc.)

### **Objective 5: Promote the cross-cutting responsibility of all actors of the food supply chain.**

- 5.1 Promote a stable platform to define voluntary agreements among different stakeholders to specify measures to share the impact of food losses and food waste

### **Objective 6: Facilitate fruit recovery, which was not able to sell but could still be consumed, in all stages of the food supply chain.**

- 6.1 Establish a gleaning programme for the primary sector
- 6.2 Carry out a technical study at the wholesale markets to develop food waste collection and management systems that allow the food waste quantification and the redistribution to social entities of the food still edible.

### **Objective 7: Promote research, innovation and good practices**

- 7.1 R+D awards on food losses and food waste prevention practices.



## References

Östergren et al. (2014). *FUSIONS Definitional Framework for Food Waste*. Retrieved from [https://www.eu-fusions.org/phocadownload/Publications/FUSIONS Definitional Framework for Food Waste 2014.pdf](https://www.eu-fusions.org/phocadownload/Publications/FUSIONS%20Definitional%20Framework%20for%20Food%20Waste%202014.pdf)