



Global best practice for designing interventions to reduce household food waste



FIGHT FOOD WASTE
Cooperative Research Centre
REDUCE - TRANSFORM - ENGAGE



Australian Government
Department of Industry, Science,
Energy and Resources

Business
Cooperative Research
Centres Program

This research was commissioned by the Project Steering Group for the *Designing effective interventions to reduce household food waste* project. It is part of a four-year research project delivered through the Fight Food Waste Cooperative Research Centre.

Project Steering Group members are:



Government of South Australia
Green Industries SA



Nourishing Our Country



Authors

Dr Gamithri Gayana Karunasena

Professor David Pearson

Dr Nazia Nabi

Published October 2020

Acknowledgements

The work has been supported by the Fight Food Waste Cooperative Research Centre whose activities are funded by the Australian Government's Cooperative Research Centre Program.

Disclaimer

The Fight Food Waste Cooperative Research Centre (CRC) gratefully acknowledges the Australian Government's Cooperative Research Centre Program financial contribution through the Cooperative Research Centres program as well as the participants of this project.

This document should be cited as: Karunasena, G.G, Pearson, D, Nabi, N, and Fight Food Waste CRC (2020) *Global best practice for designing interventions to reduce household food waste*, Fight Food Waste Cooperative Research Centre, Adelaide. Australia.

© Fight Food Waste Limited 2020

Level 1, Wine Innovation Central Building, Cnr Hartley Grove and Paratoo Road, URRBRAE SA 5064

enquiries@fightfoodwastecrc.com.au +61 8 8313 3564

This report may be reproduced for the purposes of research, discussion, record keeping, education use or other public benefit, provided that any such reproduction acknowledges the Fight Food Waste CRC.

Table of Contents

Executive summary.....	i
1. Introduction	1
2. Methodology	1
3. Literature review of interventions.....	3
3.1. Information and education campaigns	3
3.1.1. Intervention strategies for food related planning behaviours	3
3.1.2. Intervention strategies for food related shopping behaviours	4
3.1.3. Intervention strategies for food related storing behaviours.....	5
3.1.4. Intervention strategies for food related cooking behaviours	5
3.1.5. Intervention strategies for eating and managing leftover behaviours	6
3.2. Awareness campaigns	7
4. Factors considered when designing interventions.....	9
5. A case study based on Netherlands Nutrition Centre	14
5.1. Solving issues around cooking skills: Identifying the right portion size to cook.....	16
5.2. Solving storage issues.....	17
5.2.1. Fridge and freezer stickers.....	18
5.2.2. Fridge tag	18
5.2.3. Fridge thermometers.....	19
5.3. Developing consumers' knowledge and sensing skills.....	20
5.4. National campaign for the Waste-Free week	21
5.5. Awareness raising among schools and universities	23
5.6. Measurements and evaluation	24
5.7. Results	24
6. Other interventions designed by different countries or organizations	25
6.1. Skills development	26
6.1.1. Promoting and helping with meal planning	26
6.1.2. Promoting and helping with creating a shopping list	27
6.1.3. Developing skills around storing.....	29
6.1.4. Developing skills around cooking with leftover meals or ingredients.....	30
6.1.5. Promoting appropriate disposal of food waste	31
6.2. Segments, seasons, and food cultures-oriented interventions.....	32
6.2.1. Special segments-oriented interventions.....	32
6.2.2. Seasonal interventions.....	33
6.2.3. Food types or cultures focused interventions	34

6.3.	Behavioural Lab	34
7.	Below-the-line engagement with multiple audiences	35
7.1.	Reaching consumers one-on-one.....	35
7.2.	Community engagement.....	37
7.3.	Schools and university engagement	38
7.4.	Partnerships	39
8.	References	41

Executive summary

Household food waste constitutes the largest portion (33%) of food waste in Australia and is valued at over \$10 billion per annum. Household food waste occurs through the interaction between several behaviours. As such, countries and institutions around the world have designed numerous interventions to influence these behaviours.

This research was commissioned by the Fight Food Waste Cooperative Research Centre to identify globally designed, best practice interventions to reduce household food waste. The recommendations and specific interventions identified in this report are based on interviews with 16 experts from around the world and an extensive review of the literature.

The executive summary includes 11 recommendations for designing effective interventions to reduce household food as well as specific interventions for behaviours requiring change. It has been organised across the five components of food provisioning, namely planning for food shopping, shopping for food, storing food after it has been purchased, preparing food for eating, and disposing of uneaten food. For each specific behaviour change, the best practice interventions are identified, and examples provided.

Recommendations for designing effective interventions to reduce household food waste

Recommendation 1: Develop a robust strategy and objectives for intervention

- a) Identification of specific behaviour(s) and the change(s) being sought
- b) Estimation of how many people are already performing the specific behaviour(s)
- c) Identification of why a person would be willing to make the change(s) required
- d) Estimation of how many of these people are likely to change their behaviours
- e) Estimation of net positive impact of behaviour change on reducing food waste

Household food waste emerges as a consequence of interactions between choices made by numerous people, in variety of places and at different times. Experts have identified over 70 behaviours that could contribute to food being wasted in a household. As such, it is important an intervention begins by setting objectives based on shifting specific behaviours, for particular types of households (target segments) and/or particular products being wasted. As one interview respondent emphasized *“If you don't target particular behaviours, you will end up just talking generally about food waste reduction... So, having a clear idea of what behaviours you are trying to change and why we want them to change that behaviour is a priority”*.

Recommendation 2: Focus interventions on establishing social norms that support minimal food waste by empowering the influencers.

Establishing new social norms is the most effective way of creating enduring changes in behaviours to support household food waste reduction. Individuals tend to conform to what they perceive to be the behaviour of the majority or their ‘circle of influence’. Thus, working with social groups, which could include face-to-face contact, and social influencers to shape new social norms is important.

As one interview respondent states, *“So if we think about how do you create a series of tailored bespoke experiences for people to care? Well, if it's coming from your circle of influence and your sphere of influence, you're much more likely to listen to it than if it's coming from a government organization or a charity even”*.

Recommendation 3: Bring together team with balance of expertise in marketing communication, behaviour change, and food waste

It is important to have balanced input from experts with relevant expertise when designing an intervention. As one interview respondent stated, *“That's the learning from our early days from doing the XYZ campaign Make sure you have the right people in the room. Because you can have really great coms [communications] or marketing people, but if they don't know about behavioural change, then those won't have an impact on behavioural change. They will go in front of people, get them engaged and all that, but if you don't have behind it a strategy on what you are trying to change, and in who, and how to go about that using behavioural change theories, you will be making a lot of noise without having real impact”*.

Recommendation 4: Develop detailed understanding of context and motivation for individuals, to ensure intervention is relevant and minimises conflict with competing motives

Individuals make numerous decisions in quick succession in situations where they are dealing with multiple, and at times, conflicting motivations. Thus, it is important to consider the possibility of competing motives (or counter motives, van Geffen et al., 2020) when designing interventions. For example, a consumer can be highly motivated to reduce food waste, but at the same time highly motivated to eat healthy, and/or tasty, and/or fresh foods. As a result of these counter motivations, this person may not eat leftovers.

Recommendation 5: Select a behaviour change theory to guide interventions seeking to reduce household food waste

A behavioural change theory provides a powerful guide for planning, executing and evaluating interventions. However, currently practitioners are using different theories (see section 4) to develop household food waste interventions. For example:

- Easy, Accessible, Social and Timely (EAST): *“So, we need to be creating interventions that are easy. They need to be accessible for everyone. They need to be social so that... [they can achieve reach by being] shared and they need to be timely, which means that they will need to be getting the information at the right time when they're making decisions about whether to buy something or whether to dispose of something”*.
- Opportunity, Motivation and Ability (OMA): This has been reported in publications emerging from the REFRESH project and is being used to design interventions being led by the Netherlands Nutrition Centre.
- Practice theory: Material, meaning and competence reported in a publication emerging from the National Academies of Sciences, Engineering, and Medicine (2020).

Recommendation 6: Ensure intervention raises awareness AND encourages a change in behaviour & Recommendation 7: Ensure all touchpoints around intervention are consistent and enduring

Creating awareness is not enough to reduce household food waste. Awareness is the starting point, and it is essential the intervention includes changing behaviour, so food waste is reduced. Further, changing behaviours, most of which will be based on habits, requires consistent and repeated reinforcement – such as the informed and holistic view captured in the concept of 360 degree interventions. As one interview respondent observed, *“I think that is perhaps really important, if you're developing interventions, that you do not just stop with awareness. We need to go a bit beyond. We found in our studies that the degree to which you are aware of food waste being an issue did not really relate to how much their household food waste actually was. It was really more the next step of a motivation, realizing that you yourself can contribute, and also having the knowledge and skills to actually do something”*.

Recommendation 8: Focus intervention on stealthy nudges, where changes are easy to adopt, provide benefit(s) to the individual and meet their self-interest(s)

Interventions are more likely to result in individuals changing their behaviour when the change is easy to adopt and it provides a direct, immediate and personal benefit. Hence, although it may be difficult, it is desirable to highlight these potential benefits to the individual when communicating with the target audience. Whilst many interventions focus on money that could be saved, other less tangible benefits can be important. One interview respondent noted, *“A lot of thinking with these interventions went into how do you prove the economic case? And how do you prove other intangible benefits like just saving time?”* And they continued by providing a specific example, *“It was a lot about saving time. That was really powerful for a lot of households. Because the UK, at the time was the worst in terms of work life balance among poor households in Europe. So, your advice around food waste and better cooking that saved them time was welcomed”*.

The issue of self-interest being the dominant motivation at the point of decision making, rather than more altruistic issues which may be mentioned by individual both before and after decision is made. As one interview respondent noted *“So it seems that people sort of like it better if it's about this big food waste issue, but when it comes to actual purchasing, actually doing things and changing the behaviour, then the quality dimension or maybe price aspects and other normal personal aspects seem to be more important. If you look at literature also outside of food waste, just in general about more sustainability issues and stuff, that seems to be the general theme. Like people care about this in the abstract, but when they concretely have to buy a product and have to decide what to do with it at home, it's in self-interest, [rather] than sustainability”*.

Recommendation 9: Seek to provide visual evidence to assist individuals in appreciating positive impact from changing their behaviour

When designing interventions, it is desirable to be able to show the impact from the change in behaviour to the individual. Visualising the impact is not obvious for food waste reductions. As one interview respondent noted: *“When you have a bite of good food or you give someone a gift, you immediately see the impact. But with food waste, you don't see that impact. You don't see how your action saved the environment etc”*.

Conversely, another comment from an interview respondent provided potential opportunities to demonstrate impact: *“So you know, talking not so much about greenhouse gas emissions from food waste, but the fact that if we acted on food waste, we could take x million dollars off, you know, the equivalent impact will be taking out 2 million cars off the road is a really good point of visualising normalisation of an incident. So, people could actually say Oh, we've saved 11 million tons of Co2 equivalent greenhouse gas. Then everyone goes, What does that mean? Then, tell them that's the equivalent of taking one in five cars off the road. They go, wow! That was quite important for us as well getting the messages right, getting them in a place where people could really understand the impact of what they do”.*

Recommendation 10: Interventions with a positive tone will be more effective in reducing household food waste

Interventions will be more effective if they have a positive tone. While some interventions have a serious tone, being engaging and fun is seen to be more effective. The language should focus on saving food (instead of wasting food), use uplifting examples and on providing solutions. One interview respondent reinforced the importance of positive messaging: *“I love the IKEA food waste campaign, which is food is precious. I think that positive language is really important in successful campaigns”.*

Another interview respondent noted: *“Because it's not like one organization is just banging on about a message. If you make something fun, then it creates its own life and sort of spirals and then there's all of these organic conversations that are happening and people saying to each other, oh, my goodness, I learnt the best trick about food waste the other day, and you should totally do this and that sort of stuff you can't measure”.*

Recommendation 11: Undertake evaluation of impact by measuring change in behaviour from before and after intervention.

Understanding the impact of an intervention requires measuring the change in behaviour. It is essential this is included early in the design phase where a before or base line measurement of behaviour is taken and then followed up with an after-intervention measurement. An interview participant stated: *“Make sure you have a good measurement. Then you know you have made an impact. And you take that into account when you are designing your intervention or campaign. Otherwise you will do alot of campaigns, but if you can't measure the impact what's the point”.*

Interventions to reduce household food waste

Table 1 identifies best practice behaviour change interventions to reduce household food waste, listing specific behaviour changes within the five components of food provisioning in the household. These five components are: planning for food shopping, shopping for food, storing food after it has been purchased, preparing food for eating, and finally, disposing of uneaten food. For each of the specific behaviour changes, the best practice intervention is identified, and examples provided.

Table 1: Best Practice interventions to change specific behaviours which will assist in reducing food waste in households

Component of food provisioning	Behaviour change	Best practice interventions
All components of food provisioning	<p>Contribute to changing social norm so food is seen as valuable resource and hence not wasted</p> <p>Rationale: Most (76%) are motivated to reduce their food waste. (FFWCRC 2020)</p>	<ul style="list-style-type: none"> ▪ Tailormade training programs: E.g. Zero Waste Scotland introduced “Cascade Training” programs to interested public. Those trained then pass on food waste reduction messages to others in their influential networks. There are predesigned training programs suitable for corporates, community groups etc. A successful program that reaches even harder to reach audiences [see section 7.1 & 7.2]. ▪ Incorporate waste education within subjects in curriculum: E.g. Netherlands, Germany & Scotland incorporated waste education within subjects in curriculum at primary and secondary school, vocational and higher education training [see sections 5.5 & 7.3]. ▪ Food waste education campaigns: E.g. Sustainability Victoria and Monash Council ran an education campaign called ‘Scrap Food Waste in Monash’ to raise awareness about avoidable household food waste. In this campaign, the focus was on planning behaviours such as planning a meal, preparing shopping lists and preparing meals [see section 3.1.1]. ▪ Food waste reduction tool kits that can be shared: E.g. Think.Eat.Save campaign against food waste, organised by UNEP [see section 3.2].
Planning for food shopping	<p>Increase use of shopping list</p> <p>Rationale: Many (43%) rarely/sometimes create a comprehensive shopping list. (FFWCRC 2020)</p>	<ul style="list-style-type: none"> ▪ Introducing a flexi day in the meal plan to use leftovers LFHW NSW, Australia “Food Smart” challenge requested individuals to plan for about 3 days rather than 7 days and keep a day free to use leftovers [see section 6.1.1]. ▪ Specific consumer communications: E.g. WRAP and Love Food Hate Waste (LFHW) communications focused on transforming consumer thinking to plan for meals, rather than for products and creating the shopping list based on the meal plan [see section 6.1.1]. ▪ Competitions/challenges: E.g. Sustainability Victoria (SV) adopted the “love a list challenge” designed by LFHW. This was a four-week challenge that people signed up to. The key communication focused on getting people to write a good shopping list and sticking to it [see section 6.1.2]. ▪ Smartphone Apps: Example 1: LFHW smartphone app in the UK helps users plan meals and keeps track of the food that is already in the kitchen It sends an alert if users are about to purchase any duplicates of ingredients. The

Component of food provisioning	Behaviour change	Best practice interventions
		<p>app also allows consumers/buyers to unlock badges and share accomplishments with friends and family [see section 3.1.1].</p> <p>Example 2: Netherlands Nutrition Centre introduced a smartphone app that helps users plan meals, keep track of the food purchased to create a recipe selected through the app, and sends reminders about leftover ingredients from a recipe [see section 5.3].</p> <ul style="list-style-type: none"> ▪ Portion calculator: E.g. WRAP supported their consumers to plan their meals by adding a portion calculator on the Love food hate waste web site. Consumers could enter the number of members they're cooking for and the converter would produce the quantity the consumer needs to purchase from each ingredient [see section 6.1.1].
Food shopping	<p>Involving/partnering with supermarkets to reduce household food waste</p> <p>Rationale: Supermarkets are where most food for eating at home is purchased (FFWCRC 2020)</p>	<ul style="list-style-type: none"> ▪ Encourage considered purchasing of food, based on shopping list with minimal unplanned purchases: E.g. In the UK Tesco and Sainsbury built portion calculator functionality into their online shopping. Consumer could click on an icon, e.g. Spaghetti Bolognese and add the number of adults consuming the meal, and it would suggest the consumer the quantity of mincemeat, mushrooms, tomatoes, etc needed to prepare that recipe [see section 6.1.1]. ▪ Encourage checking of food date labels: (use by and best before dates) before purchasing perishable with short shelf life, particularly those being offered at a discount [as noted by an expert in the interview and no examples found in literature] ▪ Encourage purchases of visually 'imperfect' fresh fruits and vegetables: E.g. buy funny fruits from UNEP, waste heroes from the Netherlands, and in Australia the 'odd bunch' at Woolworths or 'I'm perfect' at Coles [see section 3.1.2].
Storing food	<p>Management of fridge</p> <p>Rationale: Some (25%) cannot see what is in the fridge/freezer. (FFWCRC 2020)</p>	<ul style="list-style-type: none"> ▪ Fridge and freezer stickers to make it easy to achieve ideal positioning of food groups: E.g.1: Netherlands Nutrition Centre has introduced a visual image of what an ideal fridge looks. E.g.2: Netherlands Nutrition Centre provided fridge and freezer stickers that shows the ideal location for different types of food [see section 5.2]. ▪ Provide practical, food safety advice on how to store food, defrost food and when to use it after defrosting: E.g. LFHW website provides storing guidelines which includes temperature, steaming, container seal, wrapping, and labelling on a large number of food items [see section 6.1.3].
Preparing food	Preparing meal with available food	<ul style="list-style-type: none"> ▪ Community events where people cook with surplus food:

Component of food provisioning	Behaviour change	Best practice interventions
	<p>Rationale: Some (27%) find it difficult to prepare meal with food at hand. (FFWCRC 2020)</p>	<p>E.g. Disco Soupe community in France invited people to cook with surplus food in a unique, fun, and musical atmosphere. Instead of making soup for immediate consumption, they focused on developing cooking and preservation skills by making jams, chutneys, pickles, and vegetable purees to take home [see section 3.1.4].</p> <ul style="list-style-type: none"> ▪ Promotes the use of ingredients in full: E.g. LFHW has a campaign called “DON’T JUST EAT IT COMPLEAT IT” this promotes the use of ingredients in full and provides tips on how to use fully use parts such as peels, stalks, seeds, vegetable tops and outer leaves [see section 6.1.4]. ▪ Provide suggestions on meals suitable for leftovers and ingredients with multiple uses: E.g. LFHW-NSW/Monash city council helps consumers with how to create multiple meals with same ingredients such as mincemeat to be used in spaghetti bolognaise and tacos on another night [see section 3.1.4].
Disposing of food not eaten	<p>Leftovers (Rationale: Uneaten leftovers are main source (32% of households) of food that is disposed of. FFWCRC 2020)</p>	
	<p>Reduce plated food not eaten.</p> <p>Rationale: Most common source of leftovers (18% of 32%). (FFWCRC 2020)</p>	<ul style="list-style-type: none"> ▪ Encourage the use of smaller sized plates: E.g. Prior studies show larger plate sizes leads to food waste [Wansink and Van Ittersum, 2013]. ▪ Offers tips and ideas: E.g. “No Food Waste” campaign offers tips and ideas on how individuals and families can eat better [see section 3.1.5]. ▪ Social norming: E.g. Empowering the community to ‘ask what’s on their plate’? [see section 3.1.5].
	<p>Reduce food prepared and not plated.</p> <p>Rationale: Second most common source of food disposal from uneaten leftovers (14% of 32%). Also, Most (63%) prepare extra food, but some (17%) of them don’t eat it and hence</p>	<ul style="list-style-type: none"> ▪ Help identify correct portion sizes: E.g. 1 WRAP introduced visual cues on packaging to indicate portion sizes [see section 6.1.1]. E.g. 2 Netherland Nutrition Centre introduced a measuring cup with portion sizes for common products such as rice and paste [see section 5.1]. E.g. 3 Netherland Nutrition Centre introduced an online serving size calculator to provide measurement of food/ingredients needed sizes [see section 6.1.1]. ▪ Provide storage including fridge/freezing tips for leftovers: E.g. LFHW website provides storing guidelines which includes temperature, steaming, container seal, wrapping, and labelling on a large number of food items [see section 6.1.3]. ▪ Provide suggestions for preparing meals with leftovers:

Component of food provisioning	Behaviour change	Best practice interventions
	dispose of it later on. (FFWCRC 2020).	E.g. 1 Campaigns such as “I Love Leftovers”, “I Value Food”, “No Food Waste” [see section 3.1.5]. E.g. 2 Websites of WRAP, Zero Waste Scotland, LFHW, Netherland Nutrition Centre and OzHarvest offers recipes that uses leftover ingredients.
	Spoilage (Rationale: Spoilage is second most common source (16% of households) of food that is disposed of. FFWCRC 2020)	
	Management of fridge Rationale: Goes off in fridge is most common source of spoilage (11% of 16%. (FFWCRC 2020)	<ul style="list-style-type: none"> ▪ ‘Eat soon’ area in fridge to be identified with recognisable tags: E.g. Netherland Nutrition Centre developed a fridge tag that creates a designated space for food that is close to expiry [see section 5.3.2]. ▪ Encourage routine fridge clean-ups: E.g. “Zero Down Your Fridge” that motivate consumers to be creative with recipes with foods that might go bad soon [see 3.1.4]. ▪ Label leftovers with description and date to help identification in fridge/freezer [see section 6.1.3] ▪ Provide specific suggestions for containers/wrapping, and labelling of food in the fridge: E.g. LFHW emphasise on the theme “Keep it fresh”. It provides specific suggestions on temperature, steaming, container seal, wrapping, and labelling [see section 3.1.3]. ▪ Fridge thermometers to show ideal temperature of 4 degrees: E.g. Netherland Nutrition Centre offered consumers free fridge thermometers [see section 5.2.3]. ▪ Provide visual cues of storage options on packets: E.g. WRAP introduced visual cues on the packaging of a loaf of bread indicating it is time to put it in the fridge/freeze [see section 6.3]. ▪ Guidelines to freezing food: E.g. WRAP, LFHW and Netherlands Nutrition Centre guidelines and challenges on how long leftovers, meat, vegetables etc can be frozen/refrigerates and kept out [see sections 5.2,5.3,5.4 & 6.1.3].
	Improve understanding of date labels. Rationale: Past use by/best before is second most common source of spoilage 5% of 16%. Also, some (22%) incorrectly think after Best	<ul style="list-style-type: none"> ▪ Provide information on meaning of both use by and best before date labels: E.g. The Netherlands Nutrition Centre produced short videos on how to correctly interpret storage instruction on packaging (e.g. The freezing logo) and share those clips on social networks, YouTube, and web site [see section 5.3.2].

Component of food provisioning	Behaviour change	Best practice interventions
	before may be unsafe and hence dispose of it. (FFWCRC 2020)	
	<p>Increase the ability to know if food is still safe to eat</p> <p>Rationale: Some (32%) could not tell if food was safe to eat. (FFWCRC 2020)</p>	<ul style="list-style-type: none"> ▪ Provide information on how to use sight and smell to recognize if food is still good to eat and encourage the use of senses: This could be for leftovers, and after best before, and even use by, dates. E.g. Netherlands Nutrition Centre tries to develop consumers sensing skills by developing a guide to identify spoilt milk [see section 5.3]. ▪ Introduce an online storage guide that shows how to store food properly and how to recognize if food is not good to eat: E.g. Netherlands Nutrition Centre developed an online storage guide for more than 200 products. it also provides information on how to recognise if food is not good to eat through the smell, colours it would look like and the texture e.g. juicy or not [see section 5.3].

1. Introduction

In recent times, household food waste caused by consumers has risen in prominence and is now considered a global problem. To reduce the amount of food wasted, several intervention strategies have been implemented and suggested by organisations. Some of these strategies are based on information and education campaigns while others focus on raising general awareness regarding reducing food waste among consumers. However almost all of them are guiding consumers to plan before shopping, store their food correctly, prepare with portion size in mind, cook what they need, serve what household members want to eat and use leftovers creatively.

The aim of this report is to understand, and provide a synthesis of, best practices adopted by researchers and practitioners within Australia and around the world to reduce household food waste. The report provides a review of literature on food waste reduction interventions implemented by organisations worldwide. The literature review is supported by interviews with experts in the area of household food waste. Finally, the report identifies potential interventions to overcome dysfunctional food waste behaviours.

2. Methodology

This study consists of two phases (i) a literature survey (ii) interviews with experts in food waste. In phase one, the study used Web of Science, Scopus, and GoogleScholar to search for the literature between 2007 and 2020, using key words such as, “food waste” AND “interventions”, “food waste” AND “prevention”, and “food waste awareness programs”. Subsequently, the articles generated from the initial search were checked manually by reading through the abstract to identify the fit for this purpose. This study excluded studies that (i) did not have households and consumers as units of analysis; (II) did not include food waste reduction interventions. Apart from the above criteria, the report focussed on originality of the examples to avoid showing similar interventions in this report. Where appropriate, one or two examples of similar interventions have been given to provide clarification.

Most literature reviews exclude grey literature in their reviews. However, this study included such literature that suggested household food waste reduction interventions relating to WRAP, Zero Waste Scotland, Netherland Nutrition Centre, REFRESH and Love Food Hate Waste campaigns across the world.

Firstly, interventions identified through literature were categorised in to two groups; (I) One, based on the information and education campaigns for specific behaviours and (ii) two, based on general awareness raising regarding the reduction of food waste among the consumers. Secondly, the information and education campaigns were sub-coded in relation to the specific behaviour (planning, shopping, storing, preparing & disposing) targeted by the intervention.

Phase two consisted of 16 interviews conducted with Australian (8) and international experts (8). An interview lasted between 30-60 minutes and was recorded after obtaining verbal consent from the participants.

The interventions explained in this report were identified as best practices by the interview participants (experts) who believed those interventions helped reduce food waste or brought behavioural changes. In certain situations, there were evidence in post launch evaluations to support their arguments. However, in most cases, experts couldn't say that it was the particular intervention that lead to the reduction in waste. Rather, it was a combination of interventions that had led to the drop in overall household food waste numbers. This was mainly due to lack of use of, intervention specific evaluations and/or the inability to isolate the impact of one intervention from another. The study identified that there is a clear gap in practice, where in many cases intervention specific evaluation methods were not incorporated when developing intervention.

Interventions discussed by the interview participants were initially coded into factors considered when designing interventions and household food waste reduction interventions. Interventions were subsequently re-coded as behaviour-oriented campaigns and types of engagement. Further, data obtained from participants from Netherlands was used to develop a case study on the interventions designed and implemented by Netherlands Nutrition Centre to reduce food waste.

Organizations represented by the interview participants

Name of the organization	No of participants
Ecologic Institute, Germany	1
Netherlands Nutrition Centre	2
Wageningen University, Netherlands	1
Zero Waste Scotland	1
Sangmyung University, South Korea	1
WRAP, UK	2
Fight Food Waste CRC	1
Sustainability Victoria	1
Environment Protection Authority, New South Wales	1
Department of Water and Environmental Regulation, Western Australia	2
Food Innovation Australia Limited	1
OzHarvest	1
Green Industries South Australia	1

3. Literature review of interventions

Several strategies have been implemented to educate consumers regarding their food related behaviours, as well as to raise awareness among consumers. Therefore, this section is divided into two subsections;

i) Information and education campaigns. The causes of household food waste emerge at different places and times associated with food related practices and routines, e.g., planning, shopping, storing, cooking, eating, and managing leftovers (Pearson, Miroso, Andrews, & Kerr, 2017; Schanes, Dobernig, & Gözet, 2018). In order to be effective, information initiatives have to specifically address the specific knowledge gaps that drive wasteful practices (Schane et al., 2018). Therefore, this subsection also includes the intervention strategies that are applicable to these food related practices and routines.

(ii) General awareness raising campaigns that may influence consumers' attitudes, behaviours, and perceptions towards the reduction of food waste problems.

3.1. Information and education campaigns

3.1.1. Intervention strategies for food related planning behaviours

Busy consumers often have the tendency to avoid checking the fridge and pantry prior to shopping, and, therefore, are more likely to purchase foods that are already available at home (Ganglbauer et al., 2013). However, careful planning of grocery shopping and meal preparation is an effective tool to prevent overbuying, and consequently, food waste. According to academic research, suggested planning strategies include writing a shopping list, compiling meal-plans in advance, or checking inventories before shopping. Stronger planning routines are also often related to less unplanned items and purchase of large pack sizes (Stancu et al., 2016).

Several intervention strategies have been executed to influence consumers' planning behaviour. For example, the British "Love Food Hate Waste (LFHW)" campaign launched a LFHW smartphone app in the UK that can help users plan meals, keep track of the food that is already in the kitchen, and send an alert if users are about to purchase any duplicate ingredients. The app also allows consumers/buyers to unlock badges and share accomplishments with friends and family (LFHW, 2007). Later on, LFHW executed an interactive program that helped Australian (NSW) households learn how to reduce food waste at home (LFHW, 2012). With regards to food related planning behaviours, the program provided suggestions on planning meals (for example, planning three dinners or every meal for the whole week), ingredients to be used in more than one meal (for example, mince in spaghetti bolognese one night and tacos another night), checking inventory and leftovers, and freezing the extra portions, if possible.

Sustainability Victoria also ran an education campaign called 'Scrap Food Waste in Monash' to raise awareness about avoidable household food waste in the Monash Council. In this campaign, the focus was given on planning behaviours such as planning a meal, preparing shopping lists and preparing meals (City of Monash, 2018).

Among these several strategies, checking availability and making a list have been found to be effective in the UK. In a recent study on food purchasing, management and waste in the UK COVID-19 lockdown situation, WRAP (2020) found some positive feedback regarding strategies such as pre-shop planning (e.g. checking cupboards and the fridge pre-shop, making a list). Specifically, consumers, who were frequent shoppers or buying more, are now aware of their food waste and adopting better food management strategies.

3.1.2. Intervention strategies for food related shopping behaviours

Evidence suggests that consumers' shopping behaviours, to some extent, are routinised (Maubach, Hoek, & McCreanor, 2009) although a majority of them claim that their purchases are accurate (Parizeau et al., 2015). Purchasing too much food during shopping trips is also common for some consumers (Evans, 2012) which can contribute to increased food waste. Therefore, several intervention strategies have been executed with a specific focus on shopping behaviours. Some of the notable suggestions are provided by UNEP (2013) and LFHW (2012). UNEP focused on "Buying Funny Fruit" as many fruits and vegetables are thrown out because of their imperfect size, shape, or colour. Buying this perfectly good fruit, at the farmer's market or elsewhere, utilizes food that might otherwise go to waste (UNEP 2013).

Suggestions were also provided in relation to date labels as consumers generally cannot distinguish between expiry dates and best-before dates. "Best-before" dates are generally manufacturer suggestions for peak quality and most foods can be safely consumed well after these dates. The important date is "use by" - eating food by that date or checking if you can freeze it.

LFHW emphasises specifically on buying with a shopping list, making a list based on ingredients from planned meals and checking the fridge and pantry to ensure availability (LFHW, 2012). They also suggested bulk-buying if there is enough room at home to store it correctly and it can be used before it spoils, to buy fruits and vegetables that are in season as they stay keep fresher for longer and are usually cheaper, to take reusable shopping bags, and to avoid shopping when hungry as it is much harder for consumers to resist impulse buys.

In a quite similar way, Dorset County Council (2008) implemented a 3-year intervention campaign delivering a 'package' of measures to engage households, including home composting, avoiding junk mail and smart shopping.

Along with these, the United Nations Environment Programme emphasised on “Shop smart” – buying only the needed foods, avoiding impulse buys, and avoiding marketing tricks that lead to buying more food than needed (UNEP, 2013).

3.1.3. Intervention strategies for food related storing behaviours

Consumers’ knowledge and behaviours in relation to storing food has an impact on the amount of household food waste. However, academic literature suggests that systematic storing and categorizing food products (e.g. systematic stacking of newer and older foods, or according to frequency of use) in combination with periodic re-ordering and/or freezing of food to extend its shelf-life can help lower the food waste generation (Schane et al., 2018). Intervention strategies that have been executed to influence consumers’ storing behaviours include actions such as freezing food, following storage guidance to keep food at its best, requesting smaller portions at restaurants, eating leftovers; whether home-cooked, from restaurants or takeaway, and donating spare food to local food banks, soup kitchens, pantries, and shelters (UNEP, 2013). With a specific focus on fridge, freezer, and pantry, LFHW emphasise on the theme “Keep it fresh”. In this regard, LFHW provided specific suggestions on temperature, steaming, container seal, wrapping, and labelling (LFHW, 2012). The recent study of WRAP (2020) found that the UK consumers are maintaining better in-home food storage e.g. keeping on top of the fridge and freezing more.

3.1.4. Intervention strategies for food related cooking behaviours

Academic research indicated several key aspects of cooking practices and skills that can generate more food waste. For example, too much food is generally prepared which are thrown away later (Graham-Rowe et al., 2014), families with children face difficulty predicting the amount their children will eat (Evans, 2011), and larger plates induce people to eat more and increase the amount of food wasted (Wansink and Van Ittersum, 2013). However, several intervention strategies to influence cooking related behaviours, practices and skills. One of the campaigns in this regard was “Zero Down Your Fridge” that motivate consumers to be creative with recipes with foods that might go bad soon. A similar initiative in the Netherlands, “Damn Food Waste” is also driven by the need for greater resource efficiency. Damn Food Waste is a multi-stakeholder coalition of the Youth Food Movement, OneWorld, Voedingscentrum, Wageningen UR, Feeding the 5000 and the EU Fusions project. They are campaigning against food waste in the Netherlands by cooking meals from food that would be otherwise wasted. The goal was ethical, revaluing the value and fun of food (Tielens and Candle, 2014).

The “I Value Food” campaign aims to raise awareness about food waste in the United States. The campaign’s website offers tools and tips on how to help end food waste and features useful articles such as “Cooking for One with Zero Waste.” The campaign’s website also offers a quiz to help see how much food individuals and families really waste every day. The Disco Bôcô feasibility study was developed, from a different perspective, from within the Disco Soupe community, a group of individuals in France committed to combating food waste by raising public awareness through organising community events that are non-moralising and send positive messages. They invited people to cook with surplus food in a unique, fun, and musical atmosphere. Instead of making soup for immediate consumption, they focused on developing cooking and preservation skills by making jams, chutneys, pickles, and vegetable purees to take home.

Other intervention strategies focused on cooking or preparing the right amount of food by following a recipe or use a serving size calculator to measure the amount of food you need (LFHW, 2012), encouraging consumers to become actors in fighting food waste. In this regard, PHENIX organises volunteering events or contests, ‘Salades solidaires’, which consists in cooking fruit salads with ingredients saved from the bin, contests to imagine and design meals with surplus food, etc. (zero waste Europe 2019). The recent study on COVID-19 lockdown organised by WRAP (2020) found that the UK consumers are executing creative approaches to cooking/preparation (e.g. batch cooking and using up leftovers).

3.1.5. Intervention strategies for eating and managing leftover behaviours

A leftover is defined broadly as food that was provided for one purpose and is now surplus to, or left over from that purpose in some way. The literature identifies two sources of leftovers. First, it may be prepared food that is “left unused or only partially used and then disposed of” (Tucker and Farrelly, 2015, p. 3). Second, leftovers are remnants of foods that were purchased as part of the ingredients for a meal, but were not totally used up in making that meal (Evans, 2011). Intervention strategies in relation to managing leftovers includes awareness raising campaigns such as “I Value Food” that offers tools and tips on how to help end food waste, and features useful articles such as “Creative Ways to Use Leftovers”. Through various social media platforms, “I Value Food” shares ways to reduce food waste. The campaign posts links on how to compost, how to cook with leftovers, and other useful resources (I value food 2015).

Another interesting campaign, organised by Sustainability Victoria, Australia, was the “I Love Leftovers” campaign that seeks to reduce avoidable food waste by encouraging people to get creative with leftovers. The campaign’s website includes useful resources, like tips on how to prepare food and store food once it has been cooked, and a tool that helps consumers find recipes to make a new meal out of leftovers.

Other intervention strategies have been suggested in relation storing leftovers. LFHW provides valuable suggestions on container, freezer, and heating (LFHW, 2012).

Besides campaigns on managing leftovers, other organisations focused on consumers' eating behaviour. In this regard, the "No Food Waste" campaign offers tips and ideas on how individuals and families can eat better. The aim of this campaign was to promote public awareness and understanding about more sustainable eating practices. The campaign hopes to empower the community to 'ask what's on their plate'.

3.2. Awareness campaigns

Apart from these information and education campaigns that have been discussed, some organisations recognised the need for awareness raising issues, thus, executed the following campaigns:

- a. **Think.Eat.Save:** This International Campaign against food waste, organised by UNEP and FAO, seeks to provide a global vision of the reduction of food waste. The campaign utilised the tagline "Reduce Your Foodprint" for this campaign. The campaign's website provided promotional videos, articles, and practical tips to reduce food waste. As a part of this campaign, a Food Waste Toolkit was created that can be shared with family and friends to help everyone become more conscious consumers. It hopes to increase public awareness and create greater understanding about the total impact of food waste by exploring questions such as:
 - What is the environmental impact of food waste?
 - How does the overproduction of food affect our health?
 - Can our food systems be improved to produce food more sustainably, and to better feed a growing population?
- b. **Feeding the 5000:** Civil society organizations are mostly driven by an environmental motive, like Feeding the 5000, initiated by British activist Tristram Stuart. Feeding the 5000 aims to reduce food waste in Western markets (see FUSION, 2016).
- c. **Cr-EAT-ive:** Cr-EAT-ive worked with school children and their parents to reduce their food waste in the home and promote key food waste prevention behaviours; The feasibility study was managed by Anatoliki, a partner in the FUSIONS programme, based in Greece. Anatoliki is an environmental organisation that works with stakeholders within Greece to achieve primarily environmental goals. 'Cr-EAT-ive' focused on educating kindergarten children in Thessaloniki about food waste prevention. Anatoliki targeted children aged 3 to 5 years as they claimed that children's eating behaviours begin at infancy and continue throughout life; by instilling behaviours which are not wasteful at an early age, the hope is the amount of food waste generated in the future is reduced.

In order to influence current behaviour within the household the children's parents and teachers were targeted through the children. Additionally, parents and teachers play an important role in establishing and maintaining food behaviours in their children.

Educating children about food waste issues and sustainability was implemented not only to raise children's and their families' awareness about this issue, but also to influence behaviour change both in the present and the future. Anatoliki worked with the kindergartens to produce, implement, and promote a suite of innovative educational materials, on the topic of food waste prevention, for both the children and their parents. The materials designed for the children were intended to be delivered in class (such as educational games) whereas the material designed for the parents were guidebooks to take home. All the materials were disseminated through the kindergarten, with the parents' materials being delivered at events, seminars and through incorporating the materials into lesson plans where parents then helped their children. Anatoliki also wanted to instil food waste prevention strategies into the kindergartens through developing a stronger collaboration between food service employees, school administrators and teachers. Guidance was developed for canteen staff on how to reduce food waste within the kindergarten during mealtimes (see FUSIONS, 2016).

- d. **Run for Save Food:** This campaign was organised by Food and Agricultural Organisation of the United Nations in 2015. To promote greater awareness of food loss and food waste, more than 4,000 dedicated runners have braved the summer heat in Bangkok in this event.
- e. **Campaign by City of Monash:** In 2018, a campaign was run by the City of Monash that asked residents to share their stories to help inspire others in the Monash community to reduce their food waste using simple tips and tricks. The winning entries were contacted in March and won from a range of food waste prizes including preserving jars, reusable produce wraps and bags, compost bins and worm farms.
- f. **Save the Food:** Save the Food is a national public service ad launched by the Natural Resources Defence Council (NRDC) and the Ad Council to raise public awareness about the environmental and socio-economic impacts of food waste. The initiative encourages consumers – who collectively waste more food than grocery stores, restaurants, or farms – to reduce the amount of food that gets trashed, thereby saving the water, energy and money that are lost along with it.

- g. **Zero Hunger Challenge:** Organised by the UN, the Zero Hunger Challenge aims to end hunger, eliminate all forms of malnutrition, and build inclusive and sustainable food systems. A crucial part of ending hunger and living more sustainably is reducing food waste by minimizing food losses during production, storage, and transport, and reducing food waste by grocers and consumers.

4. Factors considered when designing interventions

Household food waste takes place due to the interaction between number of complex variables (Pearson & Perera, 2018; Quested, Marsh, Stunell, & Parry, 2013; van Geffen, van Herpen, Sijtsema, & van Trijp, 2020). According to the WRAP representatives, there are over 70 behaviours that lead to food waste. As such, it is important that all interventions/campaigns begin by **setting objectives** based on behaviours, waster segments, wasted products or using a combination of these. An interview participant emphasized that *“if you don’t target particular behaviours, you will end up just talking generally about food waste reduction, and that is impossible to target certain people to change certain things. So, having clear idea of what behaviours you are trying to change and why we want them to change that behaviour is a priority”*. Having clear objectives and referring to it during the design phase reduces the chance of creative campaigns overshadowing the objective of the intervention/campaign.

While trying to change too many behaviours is not effective, having too little may also not generate the desired level of reduction in food waste and sustain it. Hence, deciding what behaviours a campaign must focus on is a critical success factor for a campaign. Experts in this study suggested developing a sound **rational for behaviours selected** to prioritise. They suggested building that rational based on (1) how many people are already performing that behaviour, (2) how likely the selected behaviour would have an impact, (3) based on the size of the segment, how many people are likely to change their existing behaviours and adopt this proposed behaviours and (4) why a person would want to adopt the proposed behaviours.

Participants emphasized the importance of **involving the right people** when designing a campaign and getting different stakeholders (such as local governments) involved before planning a campaign. A good team would comprise of experts in areas of marketing communication, behavior change and food waste. The following quote by one of the experts supports this argument.

“That’s the learning from our early days from doing “I love leftovers”. Make sure you have the right people in the room. Because you can have really great coms or marketing people, but if they don’t know about behavioural change, then those won’t have an impact on behavioural change.

They will go in front of people, get them engaged and all that, but if you don't have behind it a strategy on what you are trying to change, and in who, and how to go about that using behavioral change theories, you will be making a lot of noise without having real impact”.

Both participants and prior studies identified the importance of **using a behavioural change framework** when designing interventions (National Academies of Sciences, Engineering, and Medicine, 2020). However, different organizations referred to different behavioural change frameworks (Quested, 2020; Quested et al., 2013). One of the interview participants referred to a framework called EAST which stands for easy, accessible, social and timely. *“So, we need to be creating interventions that are easy. They need to be accessible for everyone. They need to be social so that you can have reach and so that they can be shared and they need to be timely, which means that they will need to be getting the information at the right time when they're making decisions about whether to buy something or whether to dispose of something. So I think that's a really interesting framework”.*

Prior studies have used theory of planned behavior (Ajzen, 1991), social practices theories (Shove et al., 2012), OMA model (Van Geffen et al., 2016) etc. to understand food waste related behavioural change (National Academies of Sciences, Engineering, and Medicine, 2020). Theories of practice posit that consumer behaviour is influenced by a combination of factors. Accordingly, a consumer's food related practices are shaped by the three key elements of practice theory (National Academies of Sciences, Engineering, and Medicine, 2020): material (e.g. technologies, infrastructure, tools, logistics); meaning (e.g. emotions, culture, values, paradigms); and competence (e.g. skills, capacity, and knowledge). Social practice theory recognizes that individuals' practices and behaviors are shaped by a combination of the three interrelated factors (Warde, 2005; Hargreaves, 2011; Shove et al., 2012).

The Netherlands Nutrition Centre and others representing the REFRESH project (Wunder et al., 2019) in the Europe refer to the MOA, consumer food waste model proposed by Van Geffen et al (2016). Their strategy ensures correct management of three key variables: opportunity (e.g. has a small fridge or cannot freeze), motivation (including interaction between motivations) and the ability (e.g. cooking with leftovers or sensing skills)(van Geffen et al., 2020).

Research carried out by a group of Dutch researchers have identified that when designing interventions, creating awareness alone is not going to stop food waste. A representative from that research team quoted:

“I think that is perhaps really important, if you're developing interventions, that you do not just stop with awareness. We need to go a bit beyond.

We found in our studies that the degree to which you are aware of food waste being an issue did not really relate to how much their household food waste actually was. It was really more the next step of a motivation, realizing that you yourself can contribute, and also having the knowledge and skills to actually do something”.

There was also a research carried out by Netherlands Nutrition Centre in an online setting on how people would respond to different messages communicated by supermarkets. They got a group of people to look at a food waste type campaign. For example, it could say *“If you buy this bread, that's going to reducing food waste and another set of people looking at a message that communicated product quality”*. They identified that people liked the supermarket better and were more positive about changes, if it was communicated against foodwaste, but they were actually more likely to buy the product if it was communicated against as having higher product quality. An interview participant quoted:

“So it seems that people sort of like it better if it's about this big food waste issue, but when it comes to actual purchasing, actually doing things and changing the behavior, then the quality dimension or maybe price aspects and other normal personal aspects seem to be more important. If you look at literature also outside of food waste, just in general about more sustainability issues and stuff, that seems to be the general theme. Like people care about this in the abstract, but when they concretely have to buy a product and have to decide what to do with it at home, it's in self interest, than sustainability”.

While understanding consumer motivations is important, Netherlands Nutrition Centre experts also emphasized **balancing consumers' counter motivations** (van Geffen et al., 2020). For example, a consumer can be highly motivated to reduce food waste, but at the same time highly motivated to eat healthy. As a result of the counter motivation, this person may not eat the leftovers until it is finished, as the consumer is driven by the need to add variety of nutrition into the diet (van Geffen, van Herpen, & van Trijp, 2017). This could lead to avoidable food waste. Another example of a competing motivations is, a consumer can be motivated to reduce food waste, but also wants to eat tastier food or fresher food (van Geffen et al., 2020). Thus, it is crucial to consider these competing motives when designing interventions.

Emphasizing the benefit the consumer gains by adopting new behaviours that are promoted was also recognized a critical success factor. One of the interview participants stated: *“A lot of thinking with these interventions went into how do you prove the economic case? And how do you prove other intangible benefits like just saving time?”* For example, they promoted batch cooking during the weekend or when the consumer had a bit more time. And emphasized that doing so could help consumer have a hot meal within 10 minutes or so.

The WRAP representative continued: *“It was a lot about saving time. That was really powerful for a lot of households. Because the UK, at the time was the worst in terms of work life balance among poor household in the Europe. So, your advice around food waste and better cooking that saved them time was welcomed”*.



Source: <https://www.facebook.com/lovefoodhatewastescotland/photos>

Emphasis is also placed on providing the opportunity to **visualize the impact the consumer made**, changing their food waste behaviours. *“When you have a bite of good food or you give someone a gift, you immediately see the impact. But with food waste, you don't see that impact. You don't see how your action saved the environment etc.”* Thus, when designing interventions, it is necessary to focus on how to show the consumer the impact of his/her behaviours. Another interview participant also supported the idea of enabling consumer to visualize the impact of food waste and their actions.

“So you know, talking not so much about greenhouse gas emissions from food waste, but the fact that if we acted on food waste, we could take x million dollars off, you know, the equivalent impact will be taking out 2 million cars off the road is a really good point of visualizing normalization of an incident. So, people could actually say Oh, we've saved 11 million tons of Co₂ equivalent greenhouse gas. Then everyone goes, What does that mean? Then, tell them that's the equivalent of taking one in five cars off the road. They go, wow! That was quite important for us as well getting the messages right, getting them in a place where people could really understand the impact of what they do”.



Source: <https://www.facebook.com/lovefoodhatewastescotland/photos>

All participants of this study demonstrated support towards interventions that focus on **establishing new social norms**. Experts believe people tend to conform to what they perceive to be the behaviour of the majority (Burchell, Rettie, & Patel, 2013). Refresh project recommends using short videos to shape consumer behaviour (Wunder et al., 2019). The following quotation supports justifies the need to establish social norms:

“We talk a lot about social norming. So that momentum you get from knowing, you know, I can tell you what to do, but nobody is going to listen to me. The people that you listen to are your friends and family. So, when I see my friends and family, doing a behavior, I'm more likely to adopt it. So, trying to create that social norm, notice that this is what everybody does. And so that is why I do it. Because we as humans have a herd mentality. We like to fit in”.

Participants emphasized the importance of delivering **positive messages**. One of the participants quoted: *“We talk a lot about not ever sharing negative statistics about food waste, not saying this a huge problem. because its actually making the problem worse apparently. Use statistics that guides us to what other people are doing. Say 80% of the people are composting. This is atually a statistic that encourages social norm rather than telling us how many tones of waste etc”.* As part of the positive, social norm campaigns Netherlands Nutrition Centre’s communications with consumers focus on: (1) the use of vocabulary around “saving food” instead of “wasting food”, (2) positive examples and (3) providing solutions. For example, using their mascot Becky and influencers to focus consumer attention to positive behaviours, solutions and actions. Other participants also reinforced the importance of positive messaging. *“I love the IKEA food waste campaign, which is food is precious. I think that positive language is really important in successful campaigns”.*

The circle of influence for a specific segment of high food wasters is an important element to consider when reshaping consumer behaviour. Studies suggest working with social groups and social influencers when trying to normalize new behaviours (Wunder et al., 2019). The ideas around the importance of social norming were also supported by participants of the study.

For example, one of the interview participants stated: *“So if we think about how do you create a series of sort of tailored bespoke experiences for people to care. Well, if it's coming from your circle of influence and your sphere of influence, you're much more likely to listen to it than if it's coming from a government organization or a charity even”*.

Successful campaigns seem to **provide consumers with practical tools** they could use to change their existing dysfunctional behaviours in relation to planning, shopping, cooking, and storing. For example, portion control measuring cups and fridge thermometers were distributed freely by Netherlands Nutrition Centre (van Dooren, Mensink, Eversteijn, & Schrijnen, 2020). Experts in the study reiterated the importance of making sure these tools were easy to adopt, easily accessible and were no cost or low-cost options to consumers. *“A participant noted: I think the way the message is framed is going to be really important. Does it seem easy to adopt and reduce the barriers to participation?”*

Participants also noted, while some messaging such as environment impact, climate change needs to have a serious outlook, other messages and interventions around food waste need be **engaging and fun** (Kim, Rundle-Thiele, & Knox, 2019). They argued that when an intervention is fun and engaging, it takes on a life of its own and becomes part of the social norm organically. One of the interview participants stated:

“Because it's not like one organization is just banging on about a message. If you make something fun, then it creates its own life and sort of spirals and then there's all of these organic conversations that are happening and people saying to each other, oh, my goodness, I learnt the best trick about food waste the other day, and you should totally do this and that sort of stuff you can't measure”.

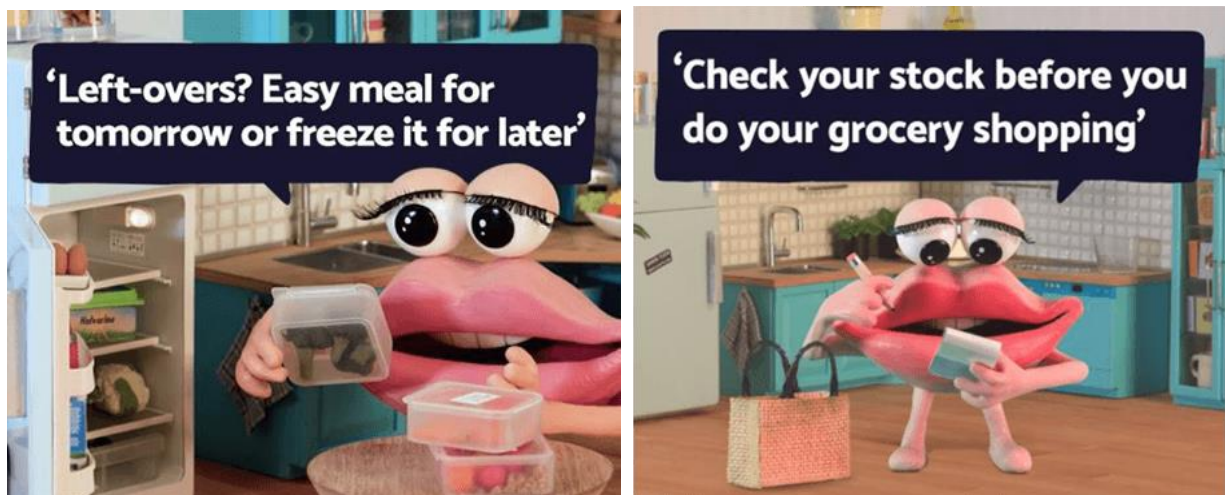
5. A case study based on Netherlands Nutrition Centre

Prior studies show that household food waste results from the interaction between several variables (Quested et al., 2013; van Geffen et al., 2020; Wunder et al., 2019). Hence, designing a food waste reduction campaign requires selection of a few behaviours to focus on, and a number of interventions to influence those behaviours. Thus, learning from successful initiatives around the world helps managers avoid reinventing the wheel. The following case study developed based on interviews with experts from Netherlands Nutrition Centre who implemented food waste reduction initiatives and literature produced by the Centre helps identify interventions used, and understand how their campaign was developed (using a theoretical model and consumer insights) around multiple food waste behaviours.

A household waste analysis survey carried out in 2019 identified that 9.5 % of purchased food were wasted by Dutch household (van Dooren, 2019). This was 34,3 Killo's of household food waste per person annually, amounting to approximately €120 per person per year. They identified bread, dairy products, vegetables, fruit, and potatoes to be the most wasted products in terms of absolute quantities.

The Netherlands national platform, Food Waste Free United was initiated with more than 70 national partners such as retailers, research companies & Netherlands Nutrition Center. The goal was to halve Netherlands food waste through three actions: Monitoring how much is wasted in the whole chain, reducing food waste in the supply chain at consumer level, and designing legislations to reduce food waste.

The main campaign used “Becky” the mascot, and the slogan “how waste free are you?” in all their communication. The Netherlands Nutrition Centre coordinates the consumer activities of Food Waste Free United including their campaign with Becky. They chose a mascot to build a waste reduction brand icon to give food waste a positive face that can be recognized and relatable in centre’s future campaigns. Further, Becky was used by the Netherlands Nutrition Centre to bring together highly fragmented behaviours relating to food waste and combine different messages.



Source: Netherland Nutrition Centre Presentation

This campaign focused on families with young children, because this group was identified as highest food wasters and had the highest readiness to change their behaviours. On television, YouTube, social networks, and special events, Becky educates consumers on best before date and use by date, introduces recipes to use leftovers, generates awareness around freezing etc. To have more impact, the Netherlands Nutrition Centre involved their partner companies in the Food Waste Free United to pass on these messages as well. So, they too are using Becky to bring behavioural changes through building positive social norms around food waste avoidance.



Source: <https://resource.wur.nl/en/science/show/Becky-to-stop-food-waste>.

Last year, Food Waste Free United used a lot of influencers to spread the message #foodwastefree that is their hash tag for the movement that Food Waste Free United wanted to start. All selected influencers were asked to post good examples of food saving and use #foodwastefree. For example, the leftovers with which they cook they brand it with #foodwastefree so their followers and other people can see the positive movement.



Source: Netherland Nutrition Centre Presentation

Note: Other participants of the study were also of the view that digital campaigns work well in terms of reach and awareness. However, they do not necessarily bring behavioural change in the target audience. Although it is trendy and reaches a larger audience, digital campaigns must be designed carefully and used knowing its weaknesses.

5.1. Solving issues around cooking skills: Identifying the right portion size to cook

Research carried out by Netherlands Nutrition Centre found that rice and pasta were wasted the most (%) in Netherlands and they came up with the measuring cup intervention to counter that problem (van Dooren et al., 2020).

The measuring cup intervention focused mainly on reducing food waste, but it also focused on eating healthy as the measuring cup shows the average recommended amount an individual needs to eat daily. A Netherlands Nutrition Centre representative noted: *“This helps people and makes them use it more often”*.



Source: Netherlands Nutrition Centre

In 2014 Netherlands Nutrition Centre distributed 1 million measuring cups to supermarkets for free. However, they observed that other organizations in Netherlands were also copying the measuring cup initiative. For example, a global brand copied the measuring cup. They developed storage jars with portion measuring cup on top of the jar and sold it.

With the support of their behavioural intervention lab, WRAP UK also introduced a similar initiative for portion controlling. Instead of a measuring cup, they introduced little dotted lines on the side the packet (e.g. on the packet of dried rice) which showed the optimum portion for an adult. To arrive at the right portion size, the consumer had to pour the content until they hit the dotted line.

5.2. Solving storage issues

The Netherlands Nutrition Centre has taken several initiatives to reduce storage related food waste in Netherlands. These initiatives vary from introducing a web and mobile app; 'bewaarijzer' that provides storage instructions for different types of food, web information on organizing the fridge, freezer and the pantry to distributing fridge thermometers and stickers. The following section briefly outlines some of their key initiatives.

5.2.1. Fridge and freezer stickers

The Netherlands Nutrition Centre introduced a fridge sticker that tells consumers, what to store in the fridge, out of the fridge, and whether to place it on the shelves of the fridge or the drawer.

The underpinning motive is to make the food storage related decision making easy. The interview participant noted: *“When you get home from the stores and need to store your food, then you get the information you need to know about where to store it, in exactly the place you need it”*.



Source: Netherland Nutrition Centre

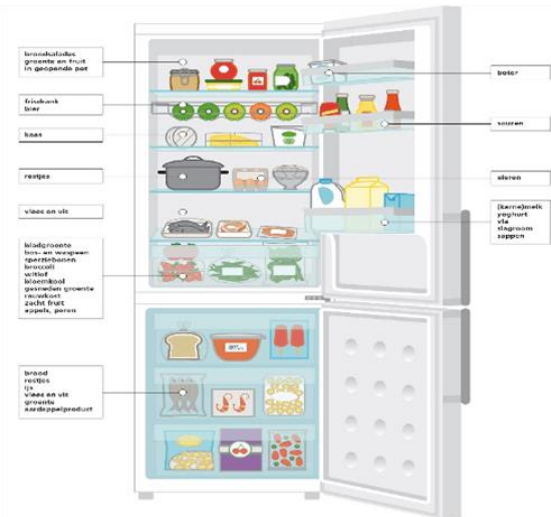
A freezer sticker was also developed to tell how long the food can be stored in the freezer. Freezer is under used in the Netherlands because the supermarkets are very near, and it is easy for the consumer to go to a supermarket frequently to purchase what they need. The freezer campaign used Becky the mascot to create awareness and the fridge stickers were freely distributed through supermarkets. The sticker indicates how long you can freeze fish, meat, leftovers, bread, vegetables and fruits. Interestingly, these initiatives were copied by other partners and brought to their customers too. For example, one of the supermarkets developed a fridge sticker copying the sticker Netherlands Nutrition Centre designed.

5.2.2. Fridge tag

Another consumer insight was food that had been wasted due to the inability to view or locate food that needs to be consumed early. The Netherlands Nutrition Centre provided a solution to this problem by introducing a fridge tag. This tag that comes in a vibrant orange colour, can be placed in the fridge and it draws consumer attention due to its recognizable colours. The idea is to place the products that must be finished quickly, behind this tag based on the date of expiry. So when the consumers open their fridges they can clearly see what should be eaten that day or tomorrow. This tag helps to structure the fridge and eat what should be eaten first.

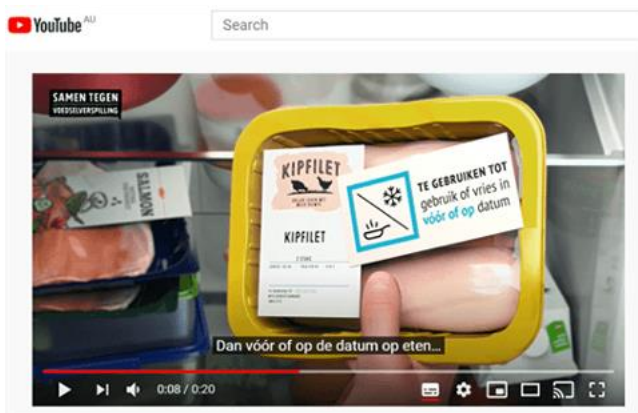


Source: Netherland Nutrition Center website



© Copyright M&B-Spanier

The Netherlands Nutrition Centre also have an image of how an ideal fridge should look. As shown in the image above it illustrates the optimal location to place milk, leftover, meat, and vegetables. This image provides a guide to the optimal ways of storing food in a fridge to keep produce fresh for a longer duration. The Netherlands Nutrition Centre has also produced short videos on how to correctly interpret storage instruction on packaging (e.g. The freezing logo) and share those clips on Television, YouTube, and web site.



Source: <https://www.youtube.com/watch?v=uZFMIObKttQ>

5.2.3. Fridge thermometers

Many people in Netherlands didn't know that the ideal fridge temperature is 4 degrees, or they didn't have access to measure the temperature in the fridge. To overcome this issue, Netherlands Nutrition Centre developed a thermometer which shows the fridge temperature and it indicates in green when it is 4 degrees. The Netherlands Nutrition Centre partnered with supermarkets to spread the thermometers to consumers.

Measuring cup, stickers and thermo meter initiatives were all funded by the government and are given free to the consumers. However, if those are ordered online from nutrition centre web site, then the consumer has to pay for the postage. WRAP UK also emphasized the importance of maintaining the right fridge temperature to avoid food waste. As such, WRAP also got few of their retailers to offer fridge thermometers as gifts to their customers.

5.3. Developing consumers' knowledge and sensing skills

The Netherlands Nutrition Centre recognized that many people do not have the knowledge of storing products correctly or the confidence to identify whether a food is good to be consumed passed the best before date. To help consumers overcome this challenge, Netherlands Nutrition Centre developed a web and app versions of an online storage organizer with storage instruction for over 2000 products. It tells the consumer where to place a product, how long it can be kept (in the freezer and the fridge), which type of expiring date should be on it and how to recognize if food is not good enough anymore (how does it smell, what colours it would look like, the texture e.g. juicy or not). By imparting knowledge, the online storage organizer rebuilds lost confidence and empowers consumers to use their senses.

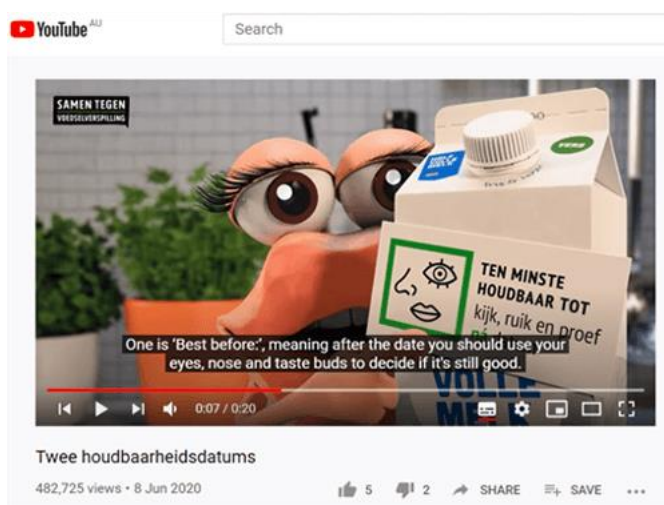
The Netherlands Nutrition Centre identified it to be a challenge in familiarizing this tool with consumers. Even when consumers know that an online storage organizer exists, consumers need to open the web app at the right moment. According to the interview participants, the web storage advisor is used very often by people. It is mainly because they have a web team who helps to optimize the search for this tool in a Google search. However, currently they do not have usage data of the mobile storage application. The Netherlands Nutrition Centre respondent emphasized the importance of having a good IT team to help customers get these storage suggestions through a very quick search.



Source: Netherland Nutrition Centre

The Netherlands Nutrition Centre research identified milk was one of the top five wasted foods. They are now in the process of developing a guide to recognize spoiled milk reduce waste of milk due to lack of consumer knowledge and confidence to recognize spoiled milk. One of the interview participants stated:

“When it comes to opening your own milk and trying to figure out whether it is good or bad, we are not good with that. our self efficacy in terms of judging bad milk is low. because we haven't tasted bad milk in a long time. so knowledge was a main factor for best by and used by dates and self efficacy. So, we tried to share knowledge using the TV commercial, you tube videos. The efficacy we might increase with the tester guide”.



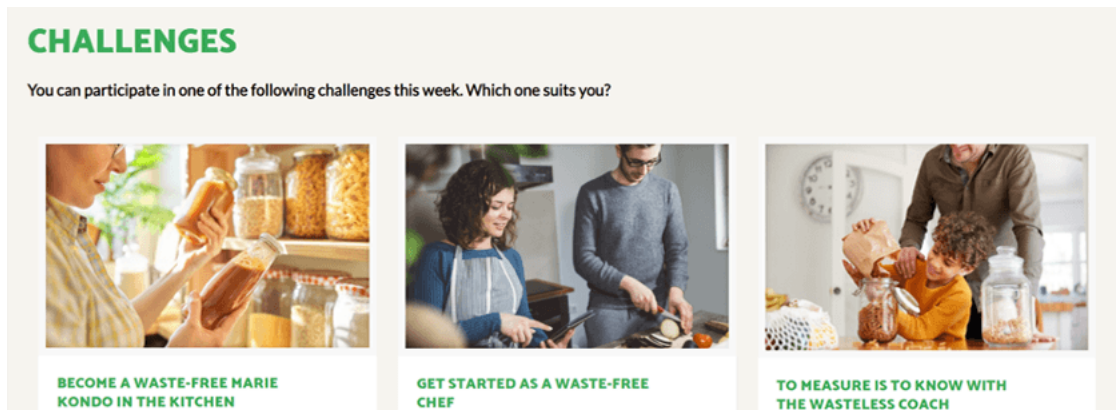
Source: <https://youtu.be/F4cAZqy5abc>

The current campaign communication for best before date encourages the use of use consumer's senses; eyes to look, nose to smell, and mouth to taste the food on the date. For used by, it says use before the date or freeze. The key learning from this video for intervention designers is the structure of the commercials. They are not simply giving knowledge about best before and used by dates, the video also provides a solution by suggesting actions people are required to take.

5.4. National campaign for the Waste-Free week

During the Food Waste-Free week from 1st-7th of September 2020, Netherlands Nutrition Centre organized (for Food Waste Free United) a national campaign that any organization could sign-up to. Both consumers and organizations (to get their employees involved) were encouraged to take up these challenges designed around improving storing, cooking and measuring skills to reduce food waste.

The figure below shows the English translation of the three challenges. The campaign shared tips on how to store product effectively and efficiently, cook with leftover ingredients and food, and deciding the right portion sizes for cooking and engages consumers by giving them small challenges around those behaviours. Other participants of the study also identified engaging the consumer, rather than simply sharing information as a critical success factor for an intervention. One of the challenges of this campaign focused on getting consumers to measure their own food waste which lead to creating awareness of how much food waste they generate as an individual.



Source: Netherland Nutrition Centre website

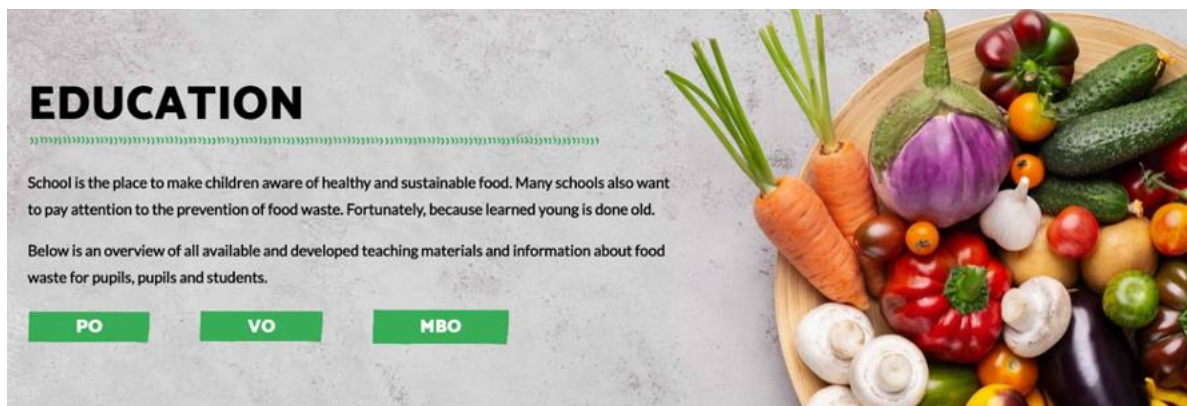
The campaign was advertised on TV, social media, Food Waste Free United website and several partner websites and had a podcast which organizations could listen to. Further, first 100 participants who sign-up for this challenge were able to win one of the 100 waste free starter packs designed by Netherlands Nutrition Centre. The campaign design focused on activities to get organizations involved to promote the waste free week. For organizations, Food Waste Free United offered posters, waste free stamps etc that could be used to promote waste free behaviours amongst their customers and employees. Separate posters were also offered to schools, councils, retailers and other organizations as well.



Source: <https://samentegenvoedselverspilling.nl/verspillingsvrijeweek/>

5.5. Awareness raising among schools and universities

There are special education packages/activities designed for primary, secondary school children and university students. The Netherlands Nutrition Centre, Food Waste Free United and few other organizations have designed teaching material packs on food waste where the teachers get information about how to teach about food waste and what are the resources that they can use. These food waste materials are integrated into educational programmes on food. Further, students get information for writing a report about food waste. They are also encouraged to do their own research for this project. Food Bank Netherland has also developed teaching materials that consists of orientation to the food bank, poverty, food waste and how the food bank works.



Source: <https://samentegenvoedselverspilling.nl/educatie/>



Source: <https://samentegenvoedselverspilling.nl/educatie/>

Primary school children learn about what is food waste, how to preserve food etc. these class lasts an average of 45-60 minutes and consists of several lessons. They take approximately 5 hours in total with a group size of about 1-8 students. There is a poster available with tips of Becky for schools and there is one colouring page of Becky with some tips.

In the Netherlands, secondary school children have to write a final project at the end of their education. The Food Waste Free United schools related materials guide them to do that on the topic of food waste. For example, a case on food waste has been developed by an expert from Wageningen University & research. This assignment requires students to devise, research and develop solutions for food waste, focusing on best before dates and consumer behaviour.

5.6. Measurements and evaluation

Most participants recommended incorporating a post launch evaluation measurement for interventions and campaigns. Having an evaluation methodology would guide developers when designing future intervention towards most appropriate interventions based on segments, products, behaviours or even a combination of these. However, participants also acknowledged the difficulty in attributing the success of reduction of food waste to one particular intervention.

In the case of Netherlands Nutrition Centre, they have adopted the following measurement tools to evaluate overall success of their campaigns.

- Sorting analysis every 3 years
- Trend analysis every 2 years
- Pre-tests campaign
- Tracking during campaign
- Other monitoring tools

5.7. Results

- Netherlands recorded a drop in solid food that is mainly wasted via residual and vegetable, fruit & garden (VFG) waste, measured per person per year, from 30.4 kg in 2016 to 26.5 kg in 2019.
- In addition, waste through other routes such as sink, toilet, animals, compost dropped from 10.8 kg in 2016 to 7.8 kg in 2019.
- 2019 records that 9.5% of purchased food is wasted. This is a gradual decrease in food waste quantities from 13.6% in 2010 and 11.1% in 2016.

- Bread, dairy products, vegetables, fruit and potatoes are wasted most. In absolute quantities, the largest decrease was found in these products (with the exception of potatoes, which are being wasted in larger quantities).
- 2019 records a drop of 21% in liquid waste per person per year disappeared down the sink or toilet. Dutch people wasted an average of 45.5 litres of drinks in 2019 in comparison to 57.3 litres reported in 2016.

For more information on their interventions visit:

Online storage tool with storage information on more than 2000 products:

<https://www.voedingscentrum.nl/nl/thema/kopen-koken-bewaren/eten-bewaren.aspx>

The Recipe app Smart cooking:

<https://www.voedingscentrum.nl/nl/gezonde-recepten/receptenapp-slim-koken.aspx>

Food waste free coach, which helps you with measuring your own food waste:

<https://apps.apple.com/nl/app/verspillingsvrijecoach/id1479993084>

Total overview of interventions and most imported tips/tricks

<https://samentegenvoedselverspilling.nl/interventies/>

Food Waste Free week from 1-7 September 2020 with challenges, tips, tricks, tools, food waste free menus etc:

<https://samentegenvoedselverspilling.nl/verspillingsvrijeweek/>

6. Other interventions designed by different countries or organizations

WRAP UK identified that there are over 70 different behaviors and different reasons as to why people waste food. Given the complex nature of food waste, it is important to influence prioritized behaviors using multiple interventions. Participants of the study also emphasized the importance of meeting consumers at the point of their consumption journey that they're currently on and taking them through the journey towards less in-home food waste. Most interventions focus on influencing planning, shopping, storing, preparing and disposing behaviours relating to household food waste. While some organizations try to tackle one of those behaviour using different interventions, others try to target behaviours using one campaign. In the following narrative one of the interview participants shares how they tried to overcome complexities of food waste by campaigning around four key behaviours.

"We developed a mantra called "look, buy, store, cook". So, we wanted it to be sort of like slip, slop, slap, but it tasted a little bit more complex... So... look what you have before you go shopping, buy only what you need, that is incredibly impactful and shop correctly. And that is obviously around making sure people have knowledge about how to purchase correctly. And then cook with what you have. So that's helping people build up their kitchen confidence.

That is really their creativity in the kitchen to open the fridge and say right, you know, this not going to be crispier. I'm going to make a meal out of this. And really moving away from always buying new ingredients every time you want to cook something and always shopping, cooking exactly to a recipe. Yes, letting people whack it in and mix it up and trial and error”.

The following sections of the report provide examples of interventions that focus on specific behaviours, segments, seasons, or food types.

6.1. Skills development

6.1.1. Promoting and helping with meal planning

LFHW Campaign, OzHarvest, Netherlands Nutrition Centre, REFRESH project and many other organizations promote meal planning. If people were shopping weekly for their food, WRAP’s communication focused on converting those people to shop for meals and not to shop for products. They believe it to be very powerful because it means people think about all the ingredients, they needed to prepare the next week’s meal.

NSW, LFHW program introduced the “Food Smart” education campaign to take people through a food waste avoidance journey. The key steps of this involves: 1) completing an online survey, 2) measuring food waste over two days and sending the results, 3) following the six steps in the action cards, 4) measuring food waste again to see if there were any changes and sending the results (<https://www.lovefoodhatewaste.nsw.gov.au/at-home/food-smart-program>).

Participants of the challenge begins their “Food Smart” food waste avoidance journey by doing a self-audit of their in-home waste to arrive at the baseline food waste. Then, the participants are sent tool kits that includes meal plans, shopping lists, shopping bags (to remind them to bring the shopping list), information of food storing, portion size, cooking with leftover etc. They also send email reminders of why participants should perform the suggested behaviours (key messages were around saving money and time). The interview participant noted:

“We provided key tips. For example for meal planning, suggested them to leave a flexi day for leftovers or you know, wanting to change your plans. Plan for two to three meals at each time rather than for seven days because we recognised that sometimes a lot of food could happen because of that”.

Then two weeks into the food waste avoidance journey and using the tool kit, participants do another self-audit of their household food waste. According to the interview participant this enables participants in the challenge to evaluate their progress and decide whether they have to adopt other food waste avoidance behaviours to reduce their waste further.

WRAP supported their consumers to plan their meals by adding a portion calculator on the Love food hate waste web site. Consumer could put in details around number of members their cooking and the converter would produce the quantity the consumer needs to purchase from each ingredient. As shown in the image below the calculator even allows the customer to put in the age of the children the consumer is cooking for.

The screenshot shows the 'Portion Planner' tool on the Love Food Hate Waste website. The interface is divided into two main sections. On the left, under 'WHAT TO DO', users can select a 'Food Type' (currently 'Meat and fish') and a specific ingredient ('Chicken (raw)'). Below this, the 'Number of people cooking/buying food for' is configured with sliders: 2 Adults, 1 Toddler (1-2 years), 1 Child (4-10 years), and 1 Child (11-18 years). On the right, under 'IT ALL ADDS UP', the calculator displays 'Calculated portions for: Chicken (raw)'. It includes storage instructions: 'Storage instructions: Store me in a sealed/ covered container in the fridge. If raw, keep me on the bottom shelf and store raw and cooked poultry separately. I can also be frozen right up to the 'Use by' date.' The results show a total weight of 387.5g for 7.5 - 9.5 thin slices (cooked), which is also the total average weight for the shopping list. At the bottom, the 'Serving Size' is defined as 'Per Adult per meal' (85-125g) and '2 thin slices (cooked)'.

Source: https://www.lovefoodhatewaste.com/portion-planner#portion_calculator

WRAP also managed to get the supermarkets to help their customers to plan their meal. One of the interview participants stated:

“We even had Tesco and Sainsbury actually build that functionality into their online shopping. You could click on an icon, say Spaghetti Bolognese, and then you'd say times four adults, and it would tell you, you need this much mince meat, you need this much mushrooms, tomatoes, etc. That was great because it just helped people to plan”.

Both Netherlands Nutrition Centre and WRAP also try to make sure the advice they provide around meal planning and recipes are nutritionally balanced as well. For example, WRAP worked with the British nutrition foundation on visual cues that reduce food waste but also offers nutritional advice. One such initiative is the packed pizza bases that comes with divisions that say “this is one healthy portion”.

6.1.2. Promoting and helping with creating a shopping list

Sustainability Victoria (SV) adopted the love a list challenge designed by LFHW. This was a four week challenge that people signed up to (their behavioural specialists had advised this was a good enough time duration to make behaviour change).

The key communication was simple, a single message and focused on getting people writing a good shopping list and sticking to it. Yet, it was strategically designed to automatically adopt a few other positive behaviours. As their representative mentioned:

“The beauty of it was that, when you tried to do it, then it calls for some of the other behaviours. You need to think of who in your household is going to be in and when and planning the meals to suite those needs and writing a shopping list based on that and sticking to that in the store. Then you buy only what you need, bring it and cook it as per your plan”.



Source: <https://www.sustainability.vic.gov.au/love-a-list-challenge-hub>

The objective of campaign advertising was to get Melbourne siders to take up the challenge. It was developed based on role modeling behavioural change principle. Modelling refers to establishing new norms surrounding a behaviour using individuals need to conform to the majority’s behaviours. This could be triggered by people’s need to belong to a social group (Burchell et al., 2013; Cialdini & Goldstein, 2004; Kallgren, Reno, & Cialdini, 2000; Wunder et al., 2019). In this context, it was about getting people that are similar to families that SV wanted to reach and impact and showing their target how other families similar to them behave. Using language such as “join thousands of other Victorians that signed up to this challenge”, SV’s advertising campaign tried to show that signing up to this challenge was what majority of Victorians were doing. SV did a big advertising campaign using video content. They identified three local families around Melbourne, got them to take up the challenge, video recorded it and put those together in a fun video. They have had fun, engaging and interesting content. SV used a celebrity to host the program.

When people signed up to challenge, they were sent a series of emails over the four weeks to help them along the way and help them overcome barriers like thinking about meals or family members changing their minds at the last minute. Between the two years they have run this challenge, SV has had around 2500 households participate in the challenge where on average people saved around \$50 on their groceries during the time.

SV incorporated an evaluation aspect at the designing phase of the challenge itself. At the end of the challenge, participants were sent a survey to assess the effectiveness of the campaign to reduce food waste. As it was difficult to get participants to measure their food waste during the challenge (due to lack of capacity or the interest to measure their food waste accurately), the survey asked qualitative questions such as by how much have you reduced the food waste over the four week challenge? Respondents had to select from a scale of reduced slightly, reduced significantly or hardly wasted anything during the challenge.

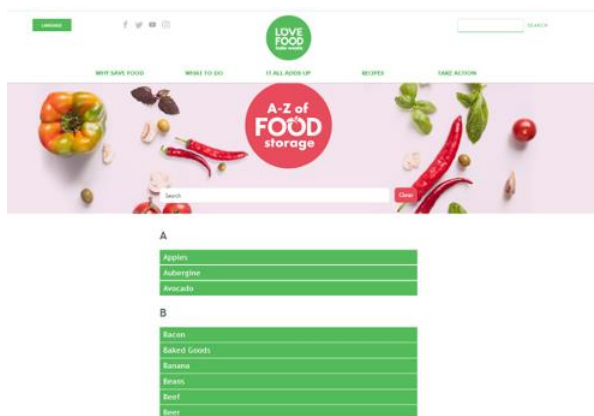
According to the post launch, 87% of the respondents reported they reduced food waste throughout the challenge. Evaluation also revealed that over half of the participants stuck to the challenge beyond the 4 weeks they were requested to. SV believes that this means participants have internalized new behaviours promoted through the campaign.

6.1.3. Developing skills around storing

WRAP introduced a guide to storing. *“So there's the snowflake logo, which was basically a shorthand for suitable freezing. And then for chilled food, there was a blue fridge logo which had information on what temperature the fridge should be at in the home, needed to make it as simple as possible for people”*. WRAP promoted freezing related information through their “Freezer is your Friend” campaign.

Similar to Netherlands Nutrition Centre, LFHW also provides practical, food safety advice on how to store food, defrost food and when to use it after defrosting. The objective was to provide clarity and consistency around expiry dates and product specific storage, freezing and defrosting guidance. One of the interview participants stated:

“These guidelines are as detailed as store your potatoes in a cold, dark place or if you store leftovers or partially consumed products, you should always put them in a bag or label them so you know what they are, the date you froze them and therefore the date you really should be using it by”.



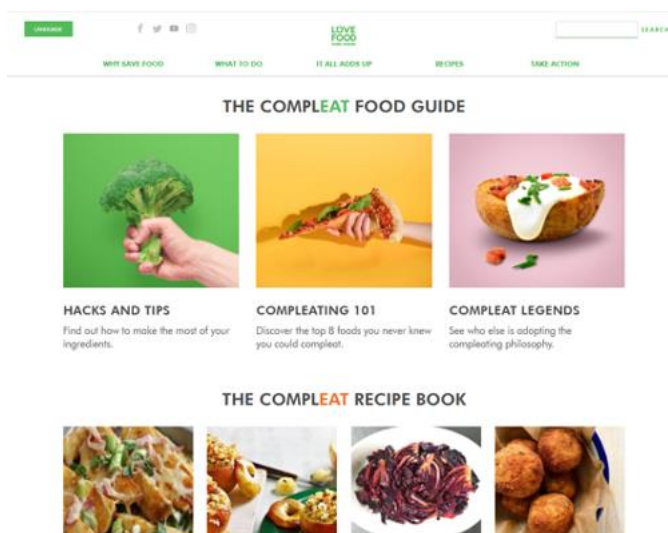
Source: <https://lovefoodhatewaste.com/article/food-storage-a-z>

The Zero Waste Scotland which shares a platform with WRAP UK engages in lot of social media and public relation campaigns around storing and freezing. They build these interventions around consumer insights such as ‘people are effectively scared of freezing, they don't know how to do it, how to defrost, they also don't know you can freeze most of the things’. One of the participants stated:

“Freezing is easier to be made to a "newsworthy" thing than storage. Because it (storage) is not sexy. It worked well for us. It was around the time of winter Olympics, so we worked with the British curling team as they are all from Scotland. We managed to get a family where three members were in the curling team and all quite young. We did a shoot with curling vegetables and stuff.. fun stuff”.

6.1.4. Developing skills around cooking with leftover meals or ingredients

All participants who were interviewed for this study identified recipes with leftover ingredients as one of the most well received and popular interventions with consumers. One of the participants noted: *“We cover other behaviours like labelling, storing in training programs. But when you look at PR aspect of it, those are less popular than recipes. Most popular were always to do with leftovers”.* LFHW has a campaign called “DON’T JUST EAT IT COMPLEATEAT IT” this promotes the use of ingredients in full and provides tips on how to use fully use parts such as peels, stalks, seeds, vegetable tops and outer leaves. However, the author recommends to identify the contribution of possibly avoidable food waste to the total household food waste, likelihood of change in behaviour and the impact of the behaviour change on reducing food waste before adopting a campaign of this nature.



Source: <https://www.lovefoodhatewaste.com/compleating>

Findings suggest the visually appealing and relatable aspects could be two of the reasons for recipes to be popular amongst consumers. Several participants were of the view that unlike their grandparents, younger consumers lack the confidence and the skills with regards to the key food waste related behaviours. As such, some experts suggested intergenerational skills sharing type interventions would reduce that gap in knowledge and skills. *“Many younger people don't have the confidence or the skills to know what to do with the food that they brought. You know our grandmother would know what to make with anything we have, but now especially younger people are struggling with that, most probably even their parents didn't know what to do with it”.*

6.1.5. Promoting appropriate disposal of food waste

Interventions with respect to food waste disposal do not directly reduce food waste, rather it reduces the negative impact of food waste on the environment. In the past, most states and territories in Australia (with the exception of NSW and Victoria) have focused on food waste disposal rather than on food waste avoidance. Hence, many programs have been introduced encouraging people to use compost bins, worm farms or disposing food waste in the correct bins. One of the Australian state government participants stated:

“We've spent a lot of time trialing worm farming and composting and even electric composters in school environments. And we've got a lot of community garden work in food and things. but our work in food waste avoidance has been really limited to date”.

Western Australia recently launched a campaign using animated human characters promoting 5 behaviours and one being using household food organics bin correctly or composting your food waste at home. One of the participants stated:

“We've gone with a compost your food waste or put it in your food organics bin if you have one.... Once those behaviors are adopted, we will introduce new behaviors along the way, and food waste avoidance will, I think fit under that behaviour change piece”.

They started off with a tracking survey to understand the baseline for the selected behaviours. And using the animated character, they plan to share messages around right behaviours using mass media and social media. Given the budgetary restrictions, they plan to partner with other organizations such as those who take waste to promote these behaviours.

Further, at the time of the interviews, most states have either just introduced FOGO bin system or were still planning to introduce it. On the other hand, with the exception of South Korea, other international participants in this research focused more on food waste avoidance.

Another participant explained how the local council has recently moved from the three bins to a four bins system and introduced FOGO.

The message here is the emphasis on frequent communication and use of multiple channels to reach different types of audiences such as baby boomers and generation 'y'.

“They had mail drops for people that aren't on social media. They push social media really hard, because it's really easy and really cheap. They did all of the old school like newspapers, advertising. Just saying, these changes are happening here's where you can find more information.

But probably the most effective thing they did was, they held community drop in days for people who wanted more information on what and why. And had, not necessarily experts, but just people with a good enough grasp of the talking points to be able to answer those people's questions there. And actually did a really good job of getting buy-in.

It is a waste management thing. But it is changing behavior in the household. And it worked well, but certainly the first two or three months daily social media posts, every newspaper for at least two months, and weekends drop in days for probably six weeks to two months.

It's really interesting because people our age (30-40years) don't go near them. But particularly where I live. It's a huge mix of demographics. So there is an older generation as well. They might see stuff on social media, you know, they're kind of on it. They see stuff on Facebook, but to understand something, they don't click on a link, they want to talk to someone. On the other hand, I would Google the website and find the information in two seconds”.

Another initiative (The Village Initiative) was taken by Lyndhurst and Waste Watch (2006) which was a 3-year project to engage rural households in waste prevention. The project was supported by a dedicated project worker who visited and engaged households. Households were provided with home compost bins free of charge.

6.2. Segments, seasons, and food cultures-oriented interventions

6.2.1. Special segments-oriented interventions

Finding on which segments to focus on had some interesting finding. Whilst many participants identified young families with kids as high wasters and focused interventions specifically to address this segments, a research carried out by OzHarvest concluded that this group did not have the ability, the capacity and to focus their time and effort on reducing food waste. One of the interview participants stated:

“What was really interesting about that is that what we learned from it was that young families don't really have the capacity, because of everything else that's going on in life, to really have a significant focus on food waste. Their priorities are for example getting kids to eat veggies... But if 70% of the broccoli ends up on the fault floor and 30% in the mouth, that's almost like a win. So, their priority is not reducing food waste. They've got other battles that they're currently focusing on.

So, what we learnt was that households with young families are not the right target audience to really be focusing a lot of resources towards to get them to reduce food waste, because they don't have something like its capacity, ability, capability maybe. And they didn't have all three of those”.

Based on the insights from their research, OzHarvest has decided that young families with kids were not their target audience. They decided to work with *“Passionate and converted, so the people who already get it, they already care. And they have capacity to share the message”*. Nevertheless, organizations such as WRAP, Zero Waste Scotland and Netherlands Nutrition Centre have designed intervention for targeting young families with kids. According to the WRAP representative, *“The freezer is your friend”* campaign was more focused around **young families with kids**.

The *“free lunch in one”* campaign by WRAP UK was targeted at **young professionals** who were early in their careers, probably looking to save money and were quite good cooks a lot of the time. Communication in this campaign focused on taking leftovers from the previous night's meal or the previous day's lunch, and then using those again to produce a new lunch.

6.2.2. Seasonal interventions

Participants designed targeted interventions for special holidays or events that causes high food waste such as Christmas or thanksgiving. Any chefs or ambassadors that Zero Waste Scotland worked with have been genuine to the cause. The following narrative explains how Zero Waste Scotland used celebrity chefs in the fight against food waste during Christmas, while targeting a specific consumer segment.

“When we chose the Scotland’s national the chef, we were looking for an ambassador who would be good for a family audience. Because it was a Christmas campaign and we know that mostly the women plan everything for Christmas. So, we wanted someone with a family but not a fancy chef who would appeal to that kind of a family, female audience. He is not a restauranter. He is a college teacher who won master chef UK years ago. But he is very much down to earth. Culturally very working class kind of a person. Nothing fancy, have 5 children and he genuinely cooks for his children at home and his wife is a chef as well. so there was nothing fake about him to the audience. This was someone who resonates with younger people too, particularly men. So, we realised from the results of the first campaign that he reached into audiences, perhaps we didn't even expect”.



“We developed the recipes for leftovers and a zero waste shopping lists for Christmas. But a lot of the messages came from him. Because, he is the professional. For example, if you carve the turkey this way, if you cook the turkey upside down you will prevent it from drying out and therefore you are less likely to waste it. all those tips went down very well”

Source: <https://www.facebook.com/lovefoodhatewastescotland/photos/>

6.2.3. Food types or cultures focused interventions

Some of the recipe interventions by WRAP focused on particular food cultures, or cuisines. WRAP closely follow food trends as well emerging cuisines of interest to consumers. One of the interview participants mentioned:

“So, we will produce meal planners for spicy foods or..., you know, that sort of thing. Where that was high in the public consciousness from all the cooking shows on TV. We always did things like, curries because there are kind of staple in the UK diet or have a Sunday roast or dinner parties was another one of those.. there are people in their 30’s that were regularly having friends over for dinner. And that’s where we used things like the portion calculator. Households weren’t always comfortable with how much food they had to buy to feed, say, 12 guests”.

6.3. Behavioural Lab

WRAP established a behavioural intervention lab that seek to find solutions to household food waste related problems. This was an initiative that was implemented in collaboration with several participants such as manufacturers, retailers and British Nutrition Foundation. This lab was a forerunner in introducing visual cues on packaging that triggered portion controlling or freezing of certain products. The following narrative by one of the interview participants explains the thought process behind a visual cue introduced to freeze bread.

“So the one that always sticks in my mind is when we looked at the consumer insights we had around bread waste, we realized that not all households were getting to the point where they were finishing the last third of the loaf.

WRAP discussed with the industry to introduce a visual cue on the bread bag, which said freeze the below and then toast it. And that was really good because it recognized a failing in terms of behavior that people, you know, either buying too big a loaf, or were not eating the loaf. Well they didn't want to waste it. And we knew that it was perfectly fine to freeze bread and then toast it. And that was quite convenient for breakfast. So, we're normalizing the behavior, you're giving a visual cue on the packaging and being really clear about why you're doing that".

Another introduction is the riped and ripening packs for fresh package produce. For example, in the case of packed mangoes. One of the mangoes in a pack will be good to eat on the same day. Another one will be good to eat in five days because it was still ripening. This reduces the food waste caused by all fresh fruits ripening at the same time.

7. Below-the-line engagement with multiple audiences

Most participants in this study identified TV and Radio to be expensive methods of reaching their target audience. As explained with examples in earlier sections of this report, websites, YouTube, application, and social networks were more popular amongst most participants of this study. As such this section of the report presents other forms of engagement examples shared by participants.

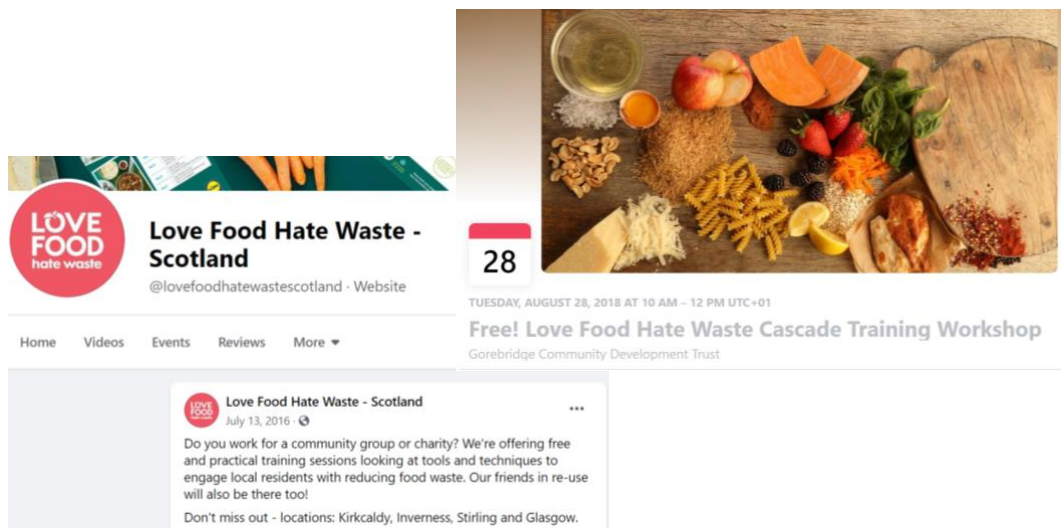
7.1. Reaching consumers one-on-one

Originally designed by WRAP and later adopted by the Zero Waste Scotland "Cascade Training" was identified as one their most successful intervention mediums that brings about behavioural changes to date. It is essentially Zero Waste Scotland lead training programs to interested public to then pass on food waste reduction messages themselves. The Zero Waste Scotland offers free training for business or any community groups if they provide a minimum of 12 attendees and a free space for Zero Waste Scotland trainers conduct the training. The Zero Waste Scotland has a team of trainers who are located around Scotland and they go out and deliver training sessions which have been trial and tested.

The Zero Waste Scotland conducts periodic evaluations pre training, just after and then roughly a month after the training. Based on these evaluations, it seems over 90% say they changed their behaviour in some way a month after the training and pass on the message to other people. Prior research has shown that for every 1 person trained, 38 other people reach message delivered at the training. It is the power of word of mouth that this training program utilises to its advantage.

One of the interview participants noted:

“We do know that nothing is more powerful than the word of mouth. If someone is your family, Facebook, community or friends says to you, oh! I heard this, I learn this, you are much more likely to take it up. So that has been very successful as well”.



Source: <https://www.facebook.com/lovefoodhatewastescotland>

Another positive aspect the Cascade Training program is its ability to reach people whom Zero Waste Scotland would not reach through other activities. For strategic reasons, they try to focus on businesses with a high number of employees below the age of 40 years and a high proportion of men. One of the interview participants noted:

“So, it’s a bit sneaky. It’s about reaching the people who would never come to our community events or green things, but who are then reached through their company because their organization cares about it due to their CSR. You know, I have done this training myself and there is always a few sceptical people at the beginning. But people actually enjoy it. it is something enjoyable”.

Some organizations also use cooking classes to engage with consumers one-on-one. One of the participants shared:

“I really thought was a pretty positive experience in the UK, was cooking classes. And so really sort of community based, but also all about, like the love of food and valuing food and inviting people into these workshops. That was on how to cook, nose to tail, how to pickle and preserve, how to make a basic stock. You know, and then through that you can also weave in other behaviors like how to store food correctly and messages around being really resourceful in the kitchen, etc”.

7.2. Community engagement

The Zero Waste Scotland participant stated that they are allocating more resources to support people to change their behaviours within their community whether that is a school or a university, a physical community or a virtual community coming together. An increasing number of community groups were funded by Zero Waste Scotland to carry out work that relate to food waste such as increasing number of community fridges, food sharing initiatives. The Zero Waste Scotland also offers a modified version of the Cascade Training to build community group members' confidence in passing out food waste reduction messages to people they engage with. The Zero Waste Scotland representative noted that in the pandemic situation, now there is increasing focus on supporting communities because they have moved to online engagement and are looking for things to do.



Free! Love Food Hate Waste Cascade Training Workshop

Details

Tuesday, August 28, 2018 at 10 AM – 12 PM UTC+01

Gorebridge Community Development Trust

Public · Hosted by **Love Food Hate Waste - Scotland, Gorebridge Community Development Trust** and 2 others

Hosted by Gorebridge Community Development Trust, this workshop is for Climate Challenge Fund (CCF) funded projects and other organisations that wish to engage members of their community on food waste reduction.

The objective of this Love Food Hate Waste workshop is to provide you with knowledge of the scale and impact of food waste in Scotland, as well as understanding and practical skills around the simple things we can all do to stop wasting food and save money in the process. This information can then be cascaded to your colleagues, community, friends and family.

You will (if you wish) receive a certificate at the end of the training. We can also provide your organisation with a certificate.

The workshop will be fun and interactive and covers the key messages of the national Love Food Hate Waste campaign, including:

- Understanding date labels
- Storage
- Better use of the freezer
- Portion sizes
- How to use up leftovers

No prior knowledge or experience is required to attend this workshop, just an interest in reducing food waste.

Source: Love food Hate Waste Scotland Facebook Page

The Zero Waste Scotland have contractors that work for another organization where they have the ideal sector offices around Scotland who does these community trainings on behalf of Zero Waste Scotland. The program's focus has always been on the key food wasting behaviours that formed the basis of LFHW campaign. However, it is reviewed periodically to see if there needs to be an update in terms of messaging. The Zero Waste Scotland participant emphasised the logistical challenges involved in these community engagement programs and suggested them to be more suitable for more decentralised operations or smaller territories.

The Zero Waste Scotland representative explained:

“Initially WRAP has developed it, and then they stopped their community engagement. It is logistically difficult for UK to have this, but we are a small country (Scotland). So, we can have these sorts of things and make an impact. It does require an investment each year from us about 60,000 pounds. But for that, a lot of people are reached. I think it is a very powerful tool. If you can, that is something I would recommend to offer”.

7.3. Schools and university engagement

All the countries and Australian states that were part of this study had school and university level education programs in the form of food waste related information introduced to the school curriculum, food waste related projects and assignments, activities involving school cafeterias, and teacher trainings.

Zero Waste Scotland, together with education specialists have teaching resources designed for primary, secondary and for the whole school. For the secondary one and two food waste is a topic or subject specific. Whether it is maths or literature, food waste is linked to the Scottish curriculum in a way that that teachers can take and use it within their curriculum. (<https://www.zerowastescotland.org.uk/food-waste/teaching-resources/primary>). They also provide advertising material such as posters as well as specific tools to reduce food waste.



Source: <https://www.zerowastescotland.org.uk>

Another avenue Zero Waste Scotland has taken to reducing food waste in schools is to work with the canteens, the kitchens, and getting people to measure food waste there and coming up with a plan together with the catering staff. However, such activities require a lot of specialised resources from the organization who develops learning material and facilitate the implementation.

The interview participant noted:

“There is a good demand, but the schools expect us to do it for them and give it to them. So, having an education officer is useful, we find that the demand is enormous. It works well if you have a super motivated teacher who decides this is what they are going to do, if not, they will not do it. But I think still you need a member of staff who really develops it and gives it to them”.

Universities are also part of the food waste related education and engagement programs. The Zero Waste Scotland is in the process of developing a tool kit for the universities. They have done the initial research into university students’ attitudes and behaviours in partnership with St Andrew's University and few other universities to find out what is wasted in universities and why. *“We can now take those things and turn it in to a tool kit because now we know the motivation, why and how much”.* Their plan is to get the student associations to run their own activities and event using the tool kit Zero Waste Scotland provides.

7.4. Partnerships

Many of the participants of the study found partnerships with different institutions such as retailers, manufacturers, food rescue organizations, food delivery organization and event organizers helped them reach a wider range of consumers.

WRAP UK partnered with Tesco home delivery service. When their drivers delivered the home delivery crates, a flyer was placed on top of the shopping bags with the week's food saving tip. So that when the shopping bag with food went into someone's kitchen, they had a flyer which said did you know that...? with some food saving tip right in front of them.

For example, one of the interview participants shared the following remarks regarding one of the tips they offered:

“The odly surface grapes from your shop, freez them as your ice cubes”. And the neat thing about that is a lot of people don't want ice cubes in their drink because it changes the taste of the drink. Frozen grape in it chills the drink without introducing any water into it. It was those sorts of very quirky things. And that was really powerful. Because people were receiving a shopping order and they were thinking about what they were going to cook later in the week. So, it was a really timely way of getting some hints and tips across”.

WRAP has also had number of discussions with smart refrigerator manufactures to improve temperature control, visibility of products and storing of food etc. to reduce household food waste. Another somewhat different partnership of WRAP is with National Federation of women's Institute.

The objective of this partnership is to get tips on reducing food waste. One of the interview participants stated:

“So, we found out things like you can't freeze a whole egg. But if you separate the white from the yolk, you could definitely. And they are just an absolute goldmine of information around her Economics cookie, cooking, storing food, all of that stuff in that project and we got I think we must have got crazy advice for something like 300 different products in the space of six months”.

Other participants shared sentiments regarding intergenerational storytelling. For example, focus group conducted by OzHarvest has revealed that people's attitudes towards food is instilled in them at an early age during engagement with their parents and grandparents.

“Their grandparents who lived through the war. So they were taught the value of food. And, wouldn't it be amazing to run a digital campaign that was about, you know, grandparents sharing stories of living in the depression and the hacks that they used. And you know, what they were taught to do to make sure that Food didn't go to waste”.

In the case of Zero Waste Scotland, they enter into partnerships with special event organizers to take the food saving message across to different types of target audiences. Given the resource intensive nature of special event, Zero Waste Scotland negotiates their sponsoring terms to get more visibility on the main stage of the event, do cookery demonstrations on stage, have an information stand and work with the event organizers to create a hype around food waste.

One of the interview participants stated:

“Any big event we've done, we don't just pay to sponsor and come alone. we have always requested for a partnership with the organizer so that you absolutely get bang for your buck so as to speak. That means event organizers today are super keen to show how sustainable they are, so you negotiate with them and you say together let's do some PR about what you are doing around food waste. so, they will do a song and dance you know, do something on their own about how to reduce food waste. otherwise you are just one of many stores and your message disappears. partnership approach doesn't cost that more, if they don't like it, we won't do it”.

8. References

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes* 50(2):179-211.

ARCADIS (2019), National Food Waste Baseline.

<https://www.environment.gov.au/system/files/pages/25e36a8c-3a9c-487c-a9cb-66ec15ba61d0/files/national-food-waste-baseline-executive-summary.pdf>

Commonwealth of Australia (2017). 'National Food Waste Strategy: Halving Australia's food waste by 2030.

City of Monash (2018). "Reducing food waste". Retrieved from <https://www.monash.vic.gov.au/Services/Environment/Living-Sustainably-in-Monash/Reducing-Food-Waste#campaign>.

Damn Food Waste <http://damnfoodwaste.com/>

Department of the Environment and Energy of Australian Government. (2017). National food waste strategy: Halving Australia's food waste by 2030. Retrieved from <http://www.environment.gov.au/system/files/resources/4683826b-5d9f-4e65-9344-a900060915b1/files/national-food-waste-strategy.pdf>.

Disco Bôcô (2016). Disco Bôcô toolkit, FUSIONS Reducing food waste through social innovation.

Dorset County Council (2008). "AEA, The social marketing practice". Mike Read Associates and The University of Northampton Household, WR0116: Waste Prevention Activity in Dorset. Summary Report and Technical Annexes. A project for Defra's WREP.

Evans, D. (2012). Beyond the throwaway society: ordinary domestic practice and asociological approach to household food waste. *Sociology*, 46(1), 41e56. <http://dx.doi.org/10.1177/0038038511416150>.

Evans, D. (2011). Beyond the throwaway society: ordinary domestic practice and a sociological approach to household food waste. *Sociology* 46, 41e56.

Fight Food Waste CRC (2020). Food Waste Australian Household Attitudes and Behaviours National Benchmarking Study Final Report, Adelaide. Australia

Food and Agriculture Organization. (2019). The state of Food and Agriculture. In *Routledge Handbook of Religion and Ecology*. <https://doi.org/10.4324/9781315764788>.

Food and Agricultural organisation of the United Nations (2015). "Save food Asia-Pacific campaign". Retrieved from <http://www.fao.org/save-food/projects/asia-pacific/en/>

FUSIONS (2016). Evaluation report, FUSIONS Reducing food waste through social innovation.

- Ganglbauer, E., Fitzpatrick, G., Comber, R. (2013). Negotiating food waste: using a practice lens to inform design. *ACM Trans. Comput. Hum. Interact.* 20, 1e25.
- Graham-Rowe, E., Jessop, D. C., & Sparks, P. (2015). Predicting household food waste reduction using an extended theory of planned behaviour. *Resources, Conservation and Recycling*, 101, 194–202. <https://doi.org/10.1016/j.resconrec.2015.05.020>.
- Hargreaves, T. (2011). Practice-ing behaviour change: Applying social practice theory to pro-environmental behaviour change. *Journal of Consumer Culture* 11(1):79-99.
- I value food (2015). "I value food". Retrieved from <https://ivaluefood.com/>
- LFHW (Love Food Hate Waste) (2012). "Social research update in reports section", available at: www.lovefoodhatewaste.nsw.gov.au.
- LFHW (Love Food Hate Waste) (2007). "Social research update in reports section", available at: www.lovefoodhatewaste.com
- LFHW, NSW. <https://www.lovefoodhatewaste.nsw.gov.au/at-home/food-smart-program>
- Lyndhurst, B. and Waste Watch (2006) WR0504: Establishing the Behaviour Change Evidence Base to Inform Community-based Waste Prevention and Recycling. Brook Lyndhurst. A project for Defra's WREP*.
- Maubach, N., Hoek, J., & McCreanor, T. (2009). An exploration of parents' food purchasing behaviours. *Appetite*, 53(3), 297e302. <http://dx.doi.org/10.1016/j.appet.2009.07.005>.
- Mugica, Y., Rose, T., & Hoover, D. (2019). "Tackling food waste in cities: a policy and program toolkit". Natural Resources Defense Council.
- National Academies of Sciences, Engineering, and Medicine (2020). *A National Strategy to Reduce Food Waste at the Consumer Level*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25876>.
- Pearson, D., & Perera, A. (2018). Reducing Food Waste: A Practitioner Guide Identifying Requirements for an Integrated Social Marketing Communication Campaign. *Social Marketing Quarterly*, 24(1), 45–57. <https://doi.org/10.1177/1524500417750830>
- Pearson, D., Miroso, M., Andrews, L., & Kerr, G. (2017). Reframing communications that encourage individuals to reduce food waste. *Communication Research and Practice*, 3(2), 137–154.
- Ponis, S. T., Papanikolaou, P. A., Katimertzoglou, P., Ntalla, A. C., & Xenos, K. I. (2017). Household food waste in Greece: A questionnaire survey. *Journal of Cleaner Production*, 149, 1268-1277.
- Quested, T. E. (2020). Guidance for evaluating interventions preventing household food waste.

- Quested, T. E., Marsh, E., Stunell, D., & Parry, A. D. (2013). Spaghetti soup: The complex world of food waste behaviours. *Resources, Conservation and Recycling*, 79, 43–51. <https://doi.org/10.1016/j.resconrec.2013.04.011>.
- Schanes, K., Dobernig, K., & Gözet, B. (2018). Food waste matters - A systematic review of household food waste practices and their policy implications. *Journal of Cleaner Production*, 182, 978–991. <https://doi.org/10.1016/j.jclepro.2018.02.030>.
- Setti, M., Banchelli, F., Falasconi, L., Segrè, A., & Vittuari, M. (2018). Consumers' food cycle and household waste. When behaviors matter. *Journal of Cleaner Production*, 185, 694–706. <https://doi.org/10.1016/j.jclepro.2018.03.024>.
- Shove, E., M. Pantzar, and M. Watson. (2012). *The dynamics of social practice: Everyday life and how it changes*. London, UK: Sage.
- Stancu, V., Haugaard, P., & Lähteenmäki, L. (2016). Determinants of consumer food waste behaviour: Two routes to food waste. *Appetite*, 96, 7–17. <https://doi.org/10.1016/j.appet.2015.08.025>
- Sustainability Victoria (2018). “Love Food Hate Waste: Don't let great taste go to waste”. Retrieved from <https://www.sustainability.vic.gov.au/campaigns/love-food-hate-waste>
- Sustainability Victoria (2013). *Victorian Statewide Garbage Bin Audits : Food , Household Chemicals and Recyclables*.
- Think. Eat. Save (2013). Think. Eat. Save. Retrieved from <https://www.thinkeatsave.org/>
- Tielen, J, Candel, J (2014). Reducing food wastage, improving food security? Food & Business Knowledge Platform.
- Tucker, C., Farrelly, T. (2015). Household food waste: the implications of consumer choice in food from purchase to disposal. *Local Environ.* 21, 682e706.
- UN (2012). “Zero Hunger Challenge”. Retrieved from <https://www.un.org/zerohunger/>
- UNEP (2013). “Think, Eat, Save: UNEP, FAO and Partners Launch Global Campaign to Change Culture”. Retrieved from <https://www.unenvironment.org/news-and-stories/press-release/think-eat-save-unep-fao-and-partners-launch-global-campaign-change>.
- Van Dooren, C. (2019). *Synthesis report on Food Waste in Dutch Households in 2019*. The Hague: The Netherlands Nutrition Centre Foundation.
- Van Dooren, C., Mensink, F., Eversteijn, K., & Schrijnen, M. (2020). Development and Evaluation of the Eetmaatje Measuring Cup for Rice and Pasta as an Intervention to Reduce Food Waste. *Frontiers in Nutrition*, 6(February), 1–11. <https://doi.org/10.3389/fnut.2019.00197>.

Van Geffen, L., Van Herpen, E., Sijtsema, S., & Van Trijp, H. (2020). Food waste as the consequence of competing motivations, lack of opportunities, and insufficient abilities. *Resources, Conservation and Recycling: X*, 5(November 2019), 100026. <https://doi.org/10.1016/j.rcrx.2019.100026>.

Van Geffen, L., Van Herpen, E., & Van Trijp, H. (2017). Quantified consumer insights on food waste Pan-European research for quantified consumer food waste understanding. Retrieved from <http://eu-refresh.org/quantified-consumer->

Wansink, B., Van Ittersum, K. (2013). Portion size me: plate-size induced consumption norms and win-win solutions for reducing food intake and waste. *J. Exp. Psychol. Appl.* 19, 320.

Warde, A. 2005. Consumption and theories of practice. *Journal of Consumer Culture* 5(2):131-153.

WRAP (2020). Banbury, the Covid-19 lockdown – food purchasing, management and waste, Prepared by WRAP & Icaro Consulting.

World Resource Institute, 2019. Reducing Food Loss and Waste: Setting a Global Action Agenda. Available on-line. https://wriorg.s3.amazonaws.com/s3fs-public/reducing-food-loss-waste-global-action-agenda_0.pdf. (Accessed 14 September 2020).

Wunder, S., Van Herpen, E., McFarland, K., Ritter, A., Van Geffen, L., Stenmarck, Å., & Hulten, J. (2019). Policies against consumer food waste. Retrieved from <https://eu-refresh.org/policies-against-consumer-food-waste>.

Zero Waste Europe (2019). “The story of Phenix zero waste consumption & production”. Retrieved from https://zerowasteurope.eu/wp-content/uploads/2019/06/zero_waste_europe_cs5_CP_phenix_en.pdf.

fightfoodwastecrc.com.au



FIGHT FOOD WASTE
Cooperative Research Centre
REDUCE - TRANSFORM - ENGAGE



Australian Government
Department of Industry, Science,
Energy and Resources

Business
Cooperative Research
Centres Program