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Household Food Waste—How to Avoid It? An Integrative Review

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Introduction

Why do people waste food at home and how can it be prevented? Answers to these questions are relevant, as most food in the developed world is wasted at consumer level (Stenmarck et al. 2016). Stimulating people to lower their food waste levels is challenging and requires a thorough understanding of the behavioural drivers and obstacles to change. In general terms, there are two perspectives one can take to understand behavioural change; an individualistic or a societal perspective. Whereas the former focusses on understanding individuals' motivation to aim for change and the implementation of this aim,

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the latter focusses on understanding the influences of societal structure (e.g. modern society) on steering collectives of people to change behaviour. This chapter takes an individualistic perspective and reviews literature on drivers and constraints for individuals to reduce their household food waste. Insights from the societal perspective can be found elsewhere (e.g. Butler et al. 2014; Halkier 2013; Hargreaves 2011).

Practitioners have already implemented interventions, usually awareness-raising campaigns, to stimulate food waste reduction at home (e.g. Love Food Hate Waste, Stop Spild Af Mad, Zu gut für die Tonne). These campaigns are impressive in their outreach and multifaceted nature and several have shown to be (in part) successful (Stöckli et al. 2018). Yet, in most cases these campaigns lack a theoretical basis, proper monitoring and effectiveness measures, making it impossible to deduce which elements drive behavioural change (see, e.g., Stöckli et al. 2018). This is unfortunate as setting up interventions is time consuming and costly and the incorporation of empirical insights is likely to increase the potential for success. Therefore, this chapter will translate the reviewed insights on the drivers and constraints for behavioural change into guidelines and suggestions for interventions with impact. This chapter does not contain new data, but instead contributes to recent work (e.g. Hebrok and Boks 2017; Stöckli et al. 2018), by making a distinction between interventions that steer towards setting an intention to lower food waste levels and interventions that steer towards implementing such an intention. This distinction will improve effective intervention development, as people in different stages towards (deliberate) behavioural change are best served by different types of interventions. People without a set intention to lower food waste levels will benefit most from interventions that stimulate intention setting and not from those that stimulate intention implementation and vice versa.

Why Do People Waste Food in Their Households?

Put simply, household food waste results from buying more food than is consumed. Yet, food is rarely discarded directly after shopping. Rather, it is discarded after performing a complex set of behaviours, each of

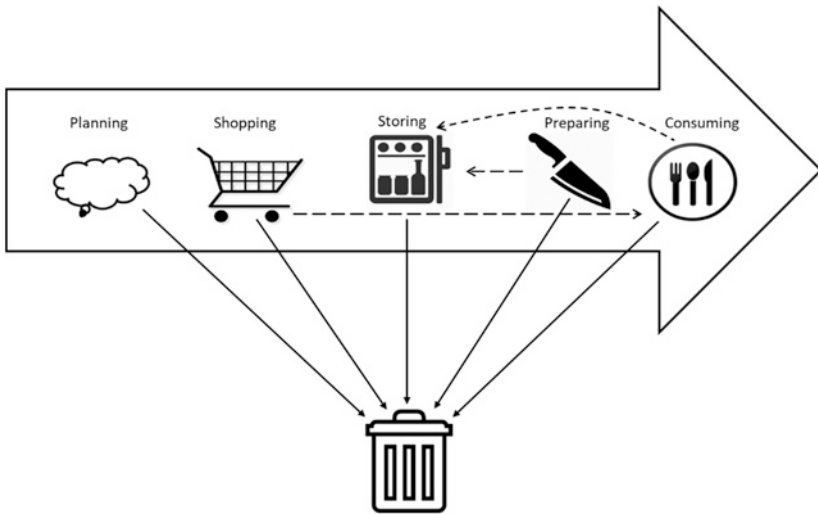


Fig. 2.1 Household food management. Dashed lines indicate food movement between stages, solid lines indicate waste

which increases the likelihood to waste (Principato 2018; Quedsted et al. 2013) (see Fig. 2.1). Understanding these household management behaviours helps to identify what interventions should target. This section first discusses the behaviours linked to food waste and then focusses on its drivers.

Behaviours Leading to Food Waste

Planning: Food management starts before food has even entered the household, namely when people decide what to buy. Meal planning and using a (mental) shopping list containing the products (and quantities) needed, are known to reduce food waste (Jörissen et al. 2015; Principato 2018; Stancu et al. 2016; Stefan et al. 2013; Van Geffen, Sijtsema, et al. 2016). This is because planning increases purchasing accuracy (Quedsted et al. 2013), thus preventing the purchase of surplus foods. However, there are also some indications that too much planning can lead to waste. Namely, in cases when it makes people do not want to deviate from their planning in order to avoid spoilage.

Shopping: How people behave in store influences their food waste levels. People who tend to buy impulsively (e.g. make spontaneous purchases that happen without much contemplation (Beatty and Ferrell 1998)) tend to waste more (Parizeau et al. 2015; Stefan et al. 2013). People who are price oriented and/or have an attraction to special offers are suggested to also waste more (Roodhuyzen et al. 2017), but recent research confirms the contrary; they seem to waste less (Jörissen et al. 2015; Koivupuro et al. 2012; Williams et al. 2012; WRAP 2014).

Storing: How food is stored (e.g. storage organisation and temperature or light intensity) affects consumers' overview of what they have in stock as well as food shelf life (Quested et al. 2011). Adequate storing practices are linked to reduce food waste into lower food waste levels (Evans 2012; Farr-Wharton et al. 2014; Quested and Luzecka 2014; Van Geffen et al. 2017), as they help accurate purchasing and prolong the time food can be eaten safely.

Preparing: Preparing relates to the processing (e.g. cooking) of food products. An often-reported cause for food waste is cooking too much unintentionally. This can be reduced by carefully measuring quantities before cooking (Quested and Murphy 2014; Van Geffen et al. 2017; Williams et al. 2012). Additionally, general cooking skills are needed to avoid accidents, such as burning the food (Evans 2011).

Consumption: This stage refers to the storing and consumption of leftovers. Obviously, saving and eating leftovers are behaviours that lead to less food waste (Stancu et al. 2016; Van Geffen et al. 2017). Leftovers can be placed back into storage and can subsequently be transformed into a new meal, eaten directly or discarded.

The behaviours described above are known to influence the level of food waste at home directly and indirectly. It is important to note that food is not always moved through all stages in a linear manner. It can also bypass some stages or be placed back into an earlier stage. For instance, ready-made meals can be bought and eaten directly and leftovers can be put back into storage.

Ideally, people would improve their household management behaviours as soon as they realise their effectiveness in food waste reduction. Yet, in reality, people already know that these behaviours have the potential to reduce waste (Van Geffen, Sijtsema, et al. 2016; WRAP 2014),

but nevertheless do not alter their behaviours. This raises the question whether people are not willing to perform these behaviours and/or whether they are unable to do so. These two questions are central in the next sections.

Drivers of Behaviours Leading to Food Waste

Behavioural change is a multiphase (iterative) process whereby people change their behaviour because they are internally or externally motivated to do so (Bamberg 2013; Nielsen 2017). Goal-directed behavioural change consists of two stages: goal setting and goal striving (Nielsen 2017). Goal setting refers to understanding why some people are motivated to prevent food waste while others are not (Bamberg 2013), whereas goal striving refers to the implementation of intentions to change. Setting an intention to change a behaviour does not equal actually performing it (Sheeran and Webb 2016) because people have multiple (food-related) goals they aim to act upon; these include ensuring that all household members have enough to eat, eat safe foods and enjoy eating (Hebrok and Boks 2017). At the same time, people only have a limited amount of time, cognitive capabilities and money to allocate to food purchases (Mann et al. 2013) and therefore need to make choices on which goals to act upon.

Food waste prevention is not easily prioritised over these other goals, as it is characterised by limited direct personal benefits, except for acting upon moral values (Steg et al. 2014). Food prices are relatively low and the social and environmental effects of food waste per household are small and distant. In contrast, several other food-related goals have strong personal (and sometimes direct) benefits such as spending little time on food shopping and cooking (gain goals), or food enjoyment (hedonic goals). People act more easily upon hedonic and gain goals than on normative ones (Steg et al. 2014). Therefore, people will implement a goal to lower waste levels more easily, when they simultaneously can act upon other valued goals and without spending too many resources (e.g. turning leftovers into tasty new meals in a short a amount of time). For this, people need abilities (i.e. skills and knowledge sets) and opportunities

(i.e. aspects from the environment) (Ölander and Thøgersen 1995; Rothschild 1999). If abilities and/or opportunities are lacking, people will be restricted in lowering their food waste levels effectively and efficiently. Therefore, stimulating people to change their daily routines will only be successful if these constraints are understood and overcome. First, we will discuss in more detail what drives goal setting and subsequently which abilities and opportunities are helpful for goal striving.

Goal Setting: Motivation to Change

There are reasons to believe that people do not want to waste food (Roodhuyzen et al. 2017), as they consider it a waste of money (Abeliotis et al. 2014; Neff et al. 2015; Rispo et al. 2015) and morally wrong (Abeliotis et al. 2014; Graham-Rowe et al. 2014). Consequently, it makes people feel guilty (Abeliotis et al. 2014; Graham-Rowe et al. 2014; Neff et al. 2015; Stancu et al. 2016). Yet, this does not mean that people consciously set a goal to reduce their waste levels, as this goal's importance should be seen relative to their other valued goals. Several aspects influence how important a certain goal is, that is attitude, problem awareness, behavioural influence and responsibility as well as social norms. These aspects will be discussed in turn.

Attitude: How problematic a person finds it to waste food is reflected by his or her thoughts and feelings (e.g. guilt) towards the issue. Attitude has been shown to be a strong predictor of intention (Ajzen 2011) and thus goal setting. Attitude towards food waste is predominately negative (Roodhuyzen et al. 2017). Yet, the variation in attitude among individuals still influences how much food they waste. Thus, the more negative a person's attitude, the less food they waste (Stancu et al. 2016; Stefan et al. 2013; Van Geffen et al. 2017).

Problem awareness: Problem awareness may influence attitudes and intentions as well as actual behaviour (Bamberg and Möser 2007; Principato 2018). In the case of food waste, people generally underestimate the scope and the consequences of global food waste levels on the environment and food distribution (Eurobarometer 2014; Secondi et al. 2015), and additionally they underestimate the amount of food they waste themselves (Abeliotis et al. 2014). This affects how much they waste, as greater problem

awareness is linked to more waste prevention behaviours (Principato et al. 2015) and lower waste levels (Stancu et al. 2016; Stefan et al. 2013; Williams et al. 2012). Although the latter has not been consistently found with regards to the awareness of the consequences of food waste, this did not always had a significant effect of waste levels (Van Geffen et al. 2017). Generally, awareness of economic consequences (i.e. the costs of their food waste) is often more important and more prevalent than awareness of social or environmental consequences (Graham-Rowe et al. 2014; Neff et al. 2015; Stancu et al. 2016; Van Geffen, Sijtsema, et al. 2016).

Behavioural influence and responsibility: For a behavioural intention to be set, people need to be aware of their behavioural influence (Bamberg and Möser 2007; Klöckner and Blöbaum 2010). If this is absent, people tend to feel that their behaviour is insignificant (Fransson and Garling 1999). A lack of behavioural influence is a common issue with pro-environmental behaviours, where solutions (i.e. lowering the environmental impact of the food system by avoiding waste) are a consequence of the collective, rather than the individual. Another common issue with pro-environmental behaviours is that people do not feel responsible for being part of the solution. Due to this lack of perceived responsibility, no intention to change is formed (Nielsen 2017). To the best of our knowledge, no study has yet looked at the effect of behavioural influence or perceived responsibility on food waste levels.

Social norms: There are two types of social norm beliefs that influence behaviour: the injunctive social norm and the descriptive social norm (Cialdini et al. 1991). The injunctive social norm refers to people's beliefs of how others who are important to them *think* about food waste, that is, beliefs on how strongly these important others disapprove of waste behaviour. This social norm does not appear to convincingly influence household management behaviours (Stefan et al. 2013; Visschers et al. 2016) or waste levels (Van Geffen et al. 2017), but may influence intentions to prevent waste (Graham-Rowe et al. 2014; Russell et al. 2017; Stancu et al. 2016). The descriptive social norm refers to the beliefs that important others waste food or not. In other socially desirable behaviours, this norm strongly influences behaviour (Cialdini and Goldstein 2004; Goldstein et al. 2008), and a similar result is found with regard to food waste behaviours (Van Geffen et al. 2017), with a single exception (Graham-Rowe et al. 2015).

In summary, people are more likely to set a goal to prevent food waste when it is considered important enough. This perceived importance is influenced by a person's attitude, problem awareness, behavioural influence and responsibility as well as social norms.

Goal Striving: Abilities and Opportunities

As already touched upon, there are two reasons why abilities and opportunities are needed to implement the goal to reduce food waste. First, they are vital to perform food waste preventing behaviours effectively and second, they can facilitate acting upon multiple (food-related) goals at once.

The skill to plan accurately: Food waste is essentially acquiring more than needed. Planning (e.g. making shopping lists or measuring how much to cook) can prevent overbuying and overcooking, but only when people accurately predict how much is needed. Accurate planning is difficult as it involves incorporating many varying aspects, such as who will be joining the meals, which portion sizes are appropriate, which products will be fancied, which foods are in stock and what is the food's current shelf-life status. People who feel more confident about their ability to plan accurately are more likely to perform behaviours that prevent food waste and waste less (Van Geffen et al. 2017).

The knowledge to prolong shelf life: Most wasted foods are perishable, such as vegetables, fruits and bakery products (Quested et al. 2011). The shelf life of these foods is influenced by how they are stored, for example at ambient temperature or cooled (fridge/freezer). Even though people often feel confident about their storing abilities, they frequently store products incorrectly (Plumb et al. 2013). For example, people tend to maintain the temperature of their refrigerator too high (Aschemann-Witzel et al. 2015) or do not use the product's packaging to prolong its shelf life (Plumb et al. 2013). This can lead to foods losing their flavour or spoiling sooner than necessary (Quested et al. 2011). This makes consumption less likely as people find taste and looks important.

The skill to estimate food safety: People often feel insecure about their ability to estimate food edibility (Brook-Lyndhurst 2011; Farr-Wharton et al. 2014) and tend to overestimate food safety risks (Grunert 2005),

causing foods to be perceived as unsafe before they actually are (Grunert 2005; Tsiros and Heilman 2005). This reduces the likelihood that foods are eaten, as it reduces the number of mealtimes that occur before the food is spoilt or perceived as spoilt. People are risk averse when it comes to food safety, but also dislike discarding edible foods. This (paradoxically) often results in people leaving their potentially unsafe foods in the fridge, until they are certain the food is spoilt (Evans 2012).

Date labels are a guideline for estimating food safety. Unfortunately, many people are confused about these labels and erroneously believe that use-by and best-before dates have a similar meaning (Graham-Rowe et al. 2014; Terpstra et al. 2005). Additionally, date labels are often unclear and difficult to find on the package, which further increases confusion (ICF 2018). Recent insights confirm that the different types of date labels increase the likelihood that foods are wasted (Wilson et al. 2017).

Another way to estimate food safety is to rely on the smell, taste or look of the food. This behaviour is known to reduce waste levels (Terpstra et al. 2005) and is therefore seen as a useful skill to advocate. There are more strategies to estimate food safety than the two discussed here (e.g. relying on days after purchasing or opening). Interestingly, people who use many different methods are more likely to waste food (Parizeau et al. 2015). This may be caused by a higher tendency to classify foods as waste (Parizeau et al. 2015), but may also reflect risk averseness with regard to food-borne illness. Correcting the misperceptions regarding date labels, as well as improving people's ability to estimate food safety based on their own senses, is likely to lower waste levels (Quested et al. 2011; Terpstra et al. 2005).

The skill to cook (creatively): Adequate cooking skills lower waste levels. These skills lead to fewer cooking accidents (Evans 2011) and simplify using all foods in time, including leftovers (Aschemann-Witzel et al. 2015). With improved cooking skills, people are more able to create tasty dishes, making it easier to prevent food waste. Thus, people who perceive their cooking skills as adequate have less household food waste (Van Geffen et al. 2017).

Dynamic lifestyle: People often lack time to perform food waste preventing behaviours due to demanding lifestyles. They feel pressure to balance multiple goals both related and unrelated to food, such as

raising children, work, social activities and household chores (Evans 2012; Quested and Luzecka 2014; Watson and Meah, 2012). It is found that experiencing time pressure is linked to higher waste levels (Mallinson et al. 2016). Additionally, day-to-day life can be unpredictable, making planning inaccurate (Evans 2012; Watson and Meah 2012). Unforeseen work or leisure activities as well as changes in the plans of household members (and their appetites) can increase uncertainties. As a result, even motivated and skilled individuals may not implement food waste preventing behaviours, or implement them but without the desired results.

Available food supply: Perishable food products can vary in quality, which makes taste and remaining shelf life unpredictable. This uncertainty increases the cognitive resources needed to prevent waste, if prevention is possible at all. Another aspect that influences waste levels is the portion sizes offered in the shops. In some cases, the desired portion size is not present, or only at a higher per-unit price. Both options encourage people to buy more than needed (Quested and Luzecka 2014). If sizes are too large, this also has an indirect effect on waste generation, as individuals are more willing to accept waste from larger packaging sizes (Wilson et al. 2017).

Accessibility of shops: Another food infrastructure aspect is accessibility. The geographical density of shops around the household combined with their opening hours may influence food waste levels. Households without easy access to shops are more likely to waste as they need to buy larger quantities in one go, increasing the likelihood to buy more than needed (Abeliotis et al. 2014; Evans 2011).

Equipment at home: It is assumed that the availability and size of storage equipment (i.e. fridge, freezer and storage boxes) at home influence waste levels. More possibilities to store food in an appropriate way may increase the likelihood that food is eaten before becoming spoiled. Yet, the opposite may also occur as people with more storage space may be likely to stock too much food. These effects may cancel each other out, which would account for the reported non-significant effects (Van Geffen et al. 2017), although more research is needed to confirm this. Additionally, kitchen appliances (e.g. blenders or toasters) can lower

food waste levels as they provide the opportunity to turn old, disliked products into tasty ones (Mattila et al. 2018).

To summarise, abilities and opportunities can hinder or support people to reduce their waste levels effectively and efficiently. In particular, abilities can help people to act upon food waste prevention and other valued goals simultaneously, for instance when they are able to plan accurately, prolong shelf life, estimate food safety and cook creatively. Opportunities can hinder or support people in preventing food waste, as they influence the amount of resources needed to perform the corresponding behaviours. These refer to lifestyle dynamics, food supply availability, shop accessibility and equipment at home.

Interventions to Facilitate Behavioural Change

In the previous sections, the behaviours causing food to become waste and the drivers of these behaviours have been discussed. These are important first steps in the development of effective interventions, as they identify which problematic behavioural aspects should be changed. Another important aspect is deciding which intervention design is most suitable, as some interventions are more suited to move people towards goal setting, whereas others are more suited to facilitate goal implementation (see Table 2.1).

Interventions to Encourage Setting the Goal to Reduce Waste Levels

For self-initiated change to occur, people need to be convinced that their food waste-related behaviours are problematic. This is why many practitioners have set up information campaigns discussing the consequences of food waste. Yet, there are also other ways to steer people towards intention setting (Abrahamse and Matthies 2012; Stöckli et al. 2018). Interventions can manipulate people's affective feelings towards food waste (emotional appeal), manipulate the social norms surrounding food waste behaviours

Table 2.1 Potential interventions against household food waste

	Motivation	Abilities	Opportunities
Goal-intention setting	<p>Information campaigns</p> <ul style="list-style-type: none"> • Campaigning to raise awareness of general food waste consequences • Campaigning to raise awareness of benefits of prevention • Information of which behaviour to change • Campaigning to elicit emotions with regard to food waste <p>Emotional appeal campaigns</p> <ul style="list-style-type: none"> • Normalising food waste prevention • Normalising specific food waste preventing behaviours (e.g. eating leftovers) <p>Social influences</p> <ul style="list-style-type: none"> • Encouraging people to set the goal to reduce waste • Encouraging people to perform a particular food waste preventing behaviour <p>Commitment</p> <ul style="list-style-type: none"> • Subsidies for low food waste levels • Privileges for low food waste levels • Praise for low food waste levels • Monetary penalties for high food waste levels • Reminders to prevent food waste (e.g. in supermarkets, on packaging or in fridges) <p>Regulations</p> <ul style="list-style-type: none"> • Encouraging people to set implementation goals (if-then scenarios) to perform a particular food waste preventing behaviour 		
Goal striving	<p>Prompts</p> <p>Implementation intention setting</p> <p>Instructions to increase abilities</p>		<p>Providing tips and tricks on:</p> <ul style="list-style-type: none"> • Meal planning • Storage information • Estimating food safety • Cooking creatively
	<p>Feedback</p> <ul style="list-style-type: none"> • Providing feedback on own waste levels (e.g. smart bins) • Launching a competition to reduce food waste 		

(continued)

Table 2.1 (continued)

Motivation	Abilities	Opportunities
Making it easy	<ul style="list-style-type: none"> • Planning apps • Measuring cups • Smart fridge 	<ul style="list-style-type: none"> • Providing appropriate packaging sizes at appropriate prices • Improving food shelf life • Placing more appropriate packaging sizes in places easy to access • Encouraging placing kitchen appliances (blender, toaster) in places easy to access

(social influences) or that make the issue of food waste more salient (commitment). A different type of intervention to change behaviour is regulation, which can induce a behavioural change by changing the costs and benefits related to food waste (prevention).

Information campaigns: In an attempt to encourage people to reduce their food waste levels, practitioners often make use of informational interventions, in particular campaigns (Stöckli et al. 2018). These campaigns focus on informing people about the consequences of food waste (e.g. environmental damage associated with food waste) and the benefits of prevention. These information campaigns are run to increase problem awareness, with the subsequent intention to reduce waste levels. Awareness and concern about an issue are essential parts of behavioural change (Klöckner and Blöbaum 2010). However, it is often insufficient when used in isolation (Abrahamse et al. 2005; Osbaldiston and Schott 2012). People are already concerned about the issue, therefore, solely further raising problem awareness will most likely have little effect. The effectiveness of information campaigns can be increased when combined with other interventions such as commitment and prompts (Stöckli et al. 2018). These additional interventions help people to prioritise food waste prevention over their other goals. Its effectiveness can further be enhanced by tailoring the message to a specific target audience (Van den Broek et al. 2017). People with strong biosphere values are more likely to respond to a message about the environmental benefits of food waste reduction than a message about the financial benefits, while the opposite seems to be true for people with more egocentric values (Van den Broek et al. 2017).

Emotional appeal campaigns: Instead of spreading factual information to increase problem awareness and concern, campaigns can also target emotions (Peter and Honea 2012). It has to be taken into consideration that the relationship between emotional appeals and behavioural change is complex. It has been found that people who feel more guilty waste less food (Van Geffen et al. 2017). Therefore, it may seem effective to impress feelings of guilt upon people who waste food. However, one should be careful when using guilt appeals as they can backfire. Guilt appeals can successfully induce intention setting (Russell et al. 2017; Wonneberger 2018), as is the case with hope and pride appeals (Peter and Honea 2012).

Yet, emotional appeals that target guilt only seem to work for people who are concerned about the issue (Wonneberger 2018), but have not implemented the desired behaviour just yet (Peter and Honea 2012) or are not concerned about the issue. Once the behaviour is (sometimes) implemented, guilt appeals are ineffective (Russell et al. 2017), while optimism appeals are more effective (Peter and Honea 2012). The ineffectiveness of guilt appeals for people who have little concern about food waste seems a reflection of defensive processing (Agrawal and Duhachek 2010). People dislike being confronted with negative emotions and therefore tend to lower this negative emotional arousal quickly (Birau and Faure 2018; Liberman and Chaiken 1992). Birau and Faure (2018) recently confirmed this with regard to food waste behaviours, showing that guilt appeals appeared ineffective for people with little concern about food waste. Moreover, blaming the consumer decreased feelings of guilt and intentions to reduce waste and instead increased waste levels (Birau and Faure 2018).

Social influences: An intervention type that has proven successful in increasing goal setting is influencing social norms. Perceived social norms related to the behaviour of others (i.e. descriptive norms) can steer people towards pro-environmental behaviours (Osbaldiston and Schott 2012). People prefer to conform to their social group (Cialdini and Goldstein 2004), and therefore they are more likely to reduce their waste levels if they feel their social group does so as well (Van Geffen et al. 2017). Social influences can be used in several ways: one can emphasise the normality of food waste prevention as well as more specific behaviours such as eating leftovers, when communicating about the issue. This emphasising can be done by making use of text, visuals or role models (Klößner 2015). This intervention strategy has been applied by practitioners, but unfortunately without effectiveness measures in relation to household food waste (WRAP 2007). Empirical studies on other (pro-environmental) behaviours (Goldstein et al. 2008; Osbaldiston and Schott 2012; Schultz et al. 2007), including reducing food waste in out-of-home situations (Hamerman et al. 2018), have shown that it can be an effective intervention.

Commitment: Commitment is giving a (public) pledge to change behaviour. This intervention has been shown to be relatively successful in changing behaviour (Abrahamse and Matthies 2012), in particular when pledges are public and specific (Klößner and Matthies 2004).

A study that combined commitment with informational interventions has confirmed that it can lower food waste levels (Schmidt 2016). A disadvantage of commitments is that this can be a costly intervention as each person needs to be approached individually. This could explain why only few practitioners have implemented this technique so far (Stöckli et al. 2018).

Regulations: Another avenue for increasing motivation to reduce food waste levels is changing the current set of consequences and benefits linked to food waste and food waste prevention (Hebrok and Boks 2017). This strategy can increase the likelihood that people will prioritise food waste prevention over other goals. Changes in the pros and cons of food waste prevention can be made by implementing a separate food waste (organic waste) collection. The negative consequences can be increased by introducing (monetary) penalties for high food waste levels (Jereme et al. 2018). The benefits of reducing food waste can also be increased by subsidies, providing special privileges or praise (Reisch et al. 2013). Although governmental regulations can be effective in changing behaviours (Reisch et al. 2013; Reisch and Zhao 2017), a downside is that it is based on externally regulated motivation. Consequently, people tend to fall back into their old behaviours as soon as the external benefits or penalties are dropped (Steg et al. 2014).

Interventions to Encourage Goal Striving

To facilitate the implementation of an intention to reduce food waste, different types of interventions can be applied (Abrahamse and Matthies 2012; Stöckli et al. 2018). These interventions focus less on increasing a person's motivation, and more on reminding them of their intention to reduce food waste levels and on making acting upon this intention easier. The interventions differ in their tactics: some are reminders of intentions (prompts) or ways to make intention more specific (implementation intention setting). Other interventions are more procedural and teach people how to reduce food waste effectively (instructions), or help them by making it easier to perform the behaviours (making it easy) or to monitor the effect of their behaviours (feedback). These will be discussed in turn.

Prompts: Prompts are reminders for people to perform food waste preventing behaviours. They can be signs or written messages to encourage people to act appropriately. Prompts work best when they are worded politely (Stöckli et al. 2018), when they address a behaviour that is easy to perform and when they are placed at the location where the behaviour takes place (Abrahamse and Matthies 2012; Osbaldiston and Schott 2012). Prompts do not change people's beliefs concerning food waste (Whitehair et al. 2013) and therefore work best for people who already intend to lower waste levels.

Implementation intention setting: Implementation intention setting resembles commitment, but is more detailed. When setting an implementation intention, people specify when, where and how they will implement their intentions (Gallo and Gollwitzer 2007). Not everyone who is asked to set such an “if-then” plan does so (Sniehotta 2009), yet for individuals who do, the intervention is effective (Abrahamse and Matthies 2012; Bamberg 2013; Hagger and Luszczynska 2014). The effectiveness of implementation intentions is moderated by habit strength (Webb et al. 2009) and is more effective when it also includes means to promote motivation and efficacy to perform the behaviour (Hagger et al. 2014).

Instructions to increase skills and knowledge: People like to receive instructions on how they can improve food handling (von Kameke and Fischer 2018). It is therefore not surprising that several interventions aim at increasing people's abilities. In particular, the instructions focus on increasing skills and knowledge sets that enable people to reduce waste levels while also acting upon their other food-related aims (Stöckli et al. 2018). Such interventions can provide tips and tricks on how to plan a meal (Romani et al. 2018; Schmidt 2016), prolong shelf life, increase inventory overview, estimate food safety (Hebrok and Boks 2017; Terpstra et al. 2005) or cook creatively (Dyen and Sirieix 2016; Närvänen et al. 2018). Providing instruction has shown to be successful when used in isolation (Romani et al. 2018), but more effective when combined with other interventions, such as commitment and prompts (Osbaldiston and Schott 2012; Schmidt 2016).

Feedback: Feedback means providing people with information about the amount of food they have wasted or saved. Previous literature on

the effect of feedback has mostly focused on energy consumption, with the use of smart metres. The type of feedback can differ and therefore also its effect (Abrahamse et al. 2005). For instance, providing continuous feedback seems to work better than giving it within a fixed time interval (daily or weekly). Additionally, the unit in which feedback is given seems to influence its effectiveness, for instance in kWh or in monetary value, as well as per day or accumulated over a period of time (Abrahamse et al. 2005). It is not yet clear how these results translate to food waste behaviours. Some scholars have attempted to mimic the studies on energy consumption by developing “smart bins” (Thieme et al. 2012). In these studies, providing feedback was not yet effective. In general, pro-environmental literature and feedback seem to be most effective for people who are already motivated (McKenzie-Mohr and Schultz 2014) and when the intervention is combined with other interventions (Stöckli et al. 2018).

Competition: A different type of feedback is comparative feedback, where people do not (only) receive information on their own behaviour, but also on that of others. This comparative feedback can be combined with a competition element. Competition encourages people to compete against each other as individuals or households to perform a desired behaviour. Comparative feedback has shown to be effective in reducing energy consumption in the short and long term (Abrahamse et al. 2005). In the case of food waste, a study that combined feedback (by filling in a diary) with competition successfully lowered food waste levels in the short term (Nieuwenkamp 2013), but its long-term effects are unknown.

Making it easy: Changing situational conditions can make it easier for people to perform food waste preventing behaviours. In the case of other (pro-environmental) behaviours, this strategy has been effective (e.g. placing recycling bins in a convenient location) (Osbaldiston and Schott 2012). Changing people’s in-home environment is challenging, but technical interventions may support food waste prevention, such as planning apps, measuring cups, smart fridges or advanced storing equipment or packaging (Bucci et al. 2010; Hebrok and Boks 2017). Additionally, adjustments in the shops may support food waste prevention, such as offering appropriate packaging sizes at appropriate prices

(Wilson et al. 2017), improving food shelf life or placing better-sized packages in places easier to access (Reisch and Zhao 2017). Other possibilities rely on people themselves altering their home environment, for instance by placing a blender so it is easy to access. These types of interventions make it easier to perform a behaviour, without significantly changing the choice structure. Interestingly, it can steer people into performing these desirable behaviours, without them even being motivated to do so (von Kameke and Fischer 2018). In the case of food waste, these interventions have not yet been investigated properly. Furthermore, even without these (technical) changes, just signalling that food waste prevention is easy may already support food waste reduction (Birau and Faure 2018).

Conclusion

This chapter reviewed the latest insights on the drivers and constraints for behavioural change towards food waste reduction into guidelines and suggestions for interventions with impact. It made a distinction between interventions that encourage goal setting to reduce food waste levels and interventions that encourage goal striving. It can be concluded that it is difficult to motivate people to actively reduce their food waste levels, despite their strong negative perceptions towards this issue. This is primarily because of the nature of food waste prevention, as this normative goal is difficult to act upon when hedonic goals and gain goals are also activated. Therefore, to successfully steer people towards food waste reduction, interventions should not (solely) provide informational awareness-raising campaigns, as people are already concerned about the issue. Rather, people are best served by interventions that focus on making food waste prevention more salient (relative to their other valued goals), for instance by providing prompts or commitment. Additionally, interventions should focus on facilitating goal striving, by improving people's abilities and opportunities to handle food effectively. Thus, interventions should enable people to handle food in such a way that they can prevent food waste while also acting upon their other valued goals, without the need to spend more resources.

This could be done by providing people with instructions, as well as altering their surroundings to make food waste reducing behaviours easier to perform. To be certain which interventions will be most effective in reducing household food waste levels, we encourage scholars to further investigate the effectiveness of different (combinations of) interventions. In order to do so, we want to stress the relevance and importance of incorporating monitoring and measurement methods when implementing an intervention, as only then the interventions' effectiveness can be evaluated; for information on this issue see Van Herpen et al. (2016), Reynolds et al. (2019).

Finally, it is important to note that this chapter has not discussed the variety of practicalities one should think about when setting up an intervention. It is out-of-scope to give a conclusive overview of all practicalities of concern, but for more information see Reynolds et al. (2019). However, an important issue we want to highlight is specifying the target audience in terms of (socio)demographics (Reynolds et al. 2019), as this identification will steer decisions on which communication channel should be used (e.g. social media, newspapers) as well as who/what should be the source of the intervention (e.g. government, retail, famous role model) (Klößner 2015). Without taken this into account, one risks setting up potentially effective interventions which does not reach its appropriate audience.

With the provided insights in this chapter we hope to have given guidelines to develop and implement effective intervention to reduce household food waste.

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