

Contextualising food waste prevention

- Decisive moments within everyday practices

Abstract

Household food waste is a matter of increasing concern for policy makers and organisations because recent research has shown that consumers contribute to about half of the edible food wasted in the developed world. The most applied measure to address the problem has been knowledge and awareness campaigns aiming at inducing changes in behaviour by educating consumers of the scale and impact of food waste, and on the meaning of date labelling. We argue that this approach is insufficient in achieving food waste reduction on a satisfactory scale, and that the potential of implementing measures into the actual contexts of food waste related practices should be further explored and developed. The research presented in this article is based on fieldwork from 26 households in Oslo, Norway. By applying a practice-oriented approach to food waste drivers, we focus on five food waste related practices: acquiring, storing, assessing, valuing and eating. Based on our analysis of how these practices are causing food waste, we identify decisive moments and contexts for food waste prevention and discuss examples of measures that could be further explored. The aim is to inspire a more contextual approach to food waste prevention by policy makers and organisations.

Keywords: Food waste, contextual measures, practice theory, fridge studies, circular economy

1. Introduction

Starting with the assumption that everyday life is performed through socially shared practices (Shove et al., 2012), the current paper argues that to reduce household food waste, preventive measures need to be implemented within the everyday food-handling practices of consumers. Through extensive fieldwork in Norwegian households, we identified decisive moments and contexts within everyday practices, where preventive measures should be applied to reduce food waste. Our research connects to sociological studies of food waste drivers that have shown food waste is caused by many interrelated practices within everyday life and cannot be attributed to a lack of knowledge and awareness alone (Evans, 2014; Mavrakis, 2014; Southerton and Yates, 2014).

In the last decade, the problem of increasing volumes of food waste has gained much attention globally. In the EU alone, an estimated 88 million tonnes of food is wasted annually, and households contribute to 53% of that waste (Stenmarck et al., 2016). Policy makers have struggled to find measures that can effectively reduce the large amount of food waste coming from households. Recently, the revised EU Waste Framework Directive introduced new legislation that set an EU-wide target of 50% reduction in food waste, a goal aligned with the Sustainable Development Goals (SDGs) of the United Nations (European Commission, 2018). Furthermore, the directive also mandated that member states must report their food waste annually from 2020 onwards.

The concept of the ‘circular economy’ is central to European environmental thinking and policy making, and the transition to a more circular economy is a major goal toward developing a sustainable, low-carbon, resource-efficient and competitive economy in the EU (European Commission, 2015). The hope is that having a circular economy will help address the environmental impact of consumption and the linear path of acquisition, use and disposal; the aim here is to keep all materials within infinite loops, reducing waste and the use of virgin materials.

The concept of a circular economy also encompasses *waste prevention*, which is placed at the top of the waste hierarchy. Thus, in the Circular Economy Action Plan (European Commission, 2015), it is stated clearly that food waste prevention is a priority area. The current article focuses on the consumption stage of the circular economy of food, as illustrated by figure

1 below, to identify decisive moments and contexts within everyday practices where food waste could be prevented.

[Figure 1 here]

Currently, there is a lack of effective measures available to governments when it comes to preventing and reducing household food waste. Besides information campaigns, there are no concrete strategies to cope with the large amount of food being wasted in the homes of European citizens. Nevertheless, the millions of consumers are seen as key in creating a circular economy through the power of their choices. Thus, political action taken against food waste at the consumer level is mostly directed at raising knowledge and awareness about food waste as an environmental and ethical problem, educating the consumer on date labelling and providing them with practical advice on how to avoid wasting food (Reisch et al., 2013). According to Richetin et al. (2012), raising knowledge and awareness is important for reducing household food waste but not necessarily decisive in creating changes in behaviour. Richetin et al.'s (2012) claim is supported by a number of contributions in the field, for instance by Cappellini and Parsons (2012), who found that attitudes and lack of knowledge and skills are not the main food waste drivers. Correspondingly, Watson and Meah (2013) argued that interventions aimed at increasing awareness are insufficient because food waste is caused by complex processes and that raising awareness does not change these processes in practice. In the Sustainable Practices Research Report of 2013, Spurling, McMeekin, Southerton, Shove and Welch mapped out the dominant problem framings of sustainability issues in policy, which downplay the influence of social phenomena, such as cultural conventions and shared understandings; furthermore, they proposed alternative framings from a practice perspective, arguing that routines, conventions, everyday resource constraints, infrastructures and institutions have to be more thoroughly taken into account in policy development, moving away from individual values and attitudes as the drivers of change (Spurling et al., 2013).

The research communities of various disciplines have extensively mapped the amount, composition and demographic variables and social and cultural drivers of food waste (FAO, 2011; Stenmarck et al., 2016; Stensgård and Hanssen, 2016; WRAP, 2017). Recently, a shift toward focusing on the measures and interventions targeting food waste prevention can be observed (e.g. Canali et al., 2017; Foden et al., 2017). Approaches within social psychology have been dominated by quantitative methodology and intervention studies focusing on

behaviour, motivation, knowledge, the individual and what stimuli might influence consumers to behave in certain ways (e.g. Schmidt, 2016; Stancu et al., 2016). This focus on the individual and behaviour-changing interventions is different from social practice approaches, which include a focus on the factors outside the individual, such as the sociocultural and material aspects of what people do in everyday life (Foden et al., 2017).

Technology-based intervention-oriented research on the prevention of household food waste to a great extent is conducted on packaging (Wikström and Williams, 2010); labelling (WRAP, 2011); smart fridges and apps (Bucci et al., 2010; Farr-Wharton et al., 2012); and fridge and bin cameras (e.g. Ganglbauer et al., 2013; Thieme et al., 2012). The HomeLab experiment approaches the disassembly and reconfiguration of food-related practices to move them in a sustainable direction and has gained interesting insights in the process (Devaney and Davies, 2017). One insight here is that researchers – playing the role of change agents when they entered the participant’s household – were crucial components of the interventions, alongside material and informational components, which rendered the latter potentially ineffective in isolation. There is still much to learn about how the sociocultural aspects of the practices of everyday life are influencing food waste levels in households (Hebrok and Boks, 2017; Porpino et al., 2015; Waitt and Phillips, 2015), which can be explored more in-depth through qualitative methods – as in the current study – and complement quantitative accounts of food waste drivers.

In the current paper, our main argument is that informing consumers about food waste as a societal problem is not sufficient enough to change how they handle food as part of their complex and interwoven everyday lives. Thus, interventions should enable change in practices without the need for information and awareness, providing helpful cues within the moment of action and reflection. To find intervention points to reduce household food waste, the effect of everyday practices and the relationships between them must be better understood. More importantly, we argue that the measures need to be applied to the context of the practices that are causing the waste. Thus, in the context of the circular economy, waste prevention measures should address the ‘use phase’ to the same, if not to a greater extent, than the acquisition and disposal phases. Our approach is in line with the recommendations made by Southerton and Yates (2014) and Evans (2012). Southerton and Yates (2014) concluded in their study on household food waste practices that a more in-depth analysis of the contexts of food-related practices is needed, whereas Evans (2012) suggested that interventions should target the

material contexts of food practices, such as, for instance, packaging sizes, to make food products better adapt to everyday challenges. According to Evans (2014, p. 50), practices causing food waste ‘are not readily amendable to the rational and deliberate models of intervention that policy makers and campaigners are currently deploying’. Furthermore, our work connects with efforts to operationalise social practice theory, which is in line with the work of Devaney and Davies (2017).

In the present article, we explore how the material infrastructure of food-handling practices, as well as the materiality of food products themselves, may represent opportunities for food waste prevention interventions directed at households. Here, material structures include different levels of materiality, from products (food, tools) and packaging to technologies (fridges, freezers, shelf-life indicators) and infrastructures (store structure, forms of procurement). Common among these items is that they are the material part of consumers’ food-handling practices and are interwoven with knowledge about food. Consumers purchase food at the grocery store, they bring packaged products home, and they store the food in the refrigerator.

The research presented is based on fieldwork conducted within 26 Norwegian households, and it describes decisive moments within everyday practices where there was an opportunity for intervention to stop practices causing food waste. We have termed the interventions aimed at these specific moments *contextual measures*, which are defined as the interventions directly linked to the time and place where food is handled. The aim is to inspire future research and policy making to explore a more contextual approach to food-waste-reducing measures.

The next sections present first how food handling is understood as practice; second, the novel method of *fridge studies* to understand food-handling practices; third, an empirical exploration of the decisive moments for food waste prevention that arise within the contexts of the practices of acquiring, storing, assessing, valuing and eating; and finally, a concluding call for a more contextual approach toward developing food waste prevention measures by policy makers and organisations. To illustrate what the concept of contextual measures might entail, we propose examples for each of these practices.

2. Fridge studies

In the current study, we understand consumption as a part of doing something else and that has ‘less to do with individual attitudes or desires than it does with the shared requirements of accomplishing a satisfactory performance of a particular practice’ (Evans, 2014, p. 19). Therefore, food waste is studied as a result of the performance of *food-handling practices*, meaning the practices involving food in various ways. This implies that food waste cannot be seen as an activity in itself; rather, it is produced as a result of many practices. Understanding how food handling is performed as a practice in households implies turning from normative discussions about food waste to making visible how food is part of and moves through mundane everyday life. *Fridge studies* have been developed as a methodological tool to learn about practices through the materials embedded within them, predominantly food, but also the kitchen infrastructure, technologies and products (de Jong and Mazé, 2017; Shove et al., 2007).

Hitchings (2012) showed that it is possible to talk about practices by connecting talk and material surroundings. Fridge studies focus on activating the food items in the kitchen to facilitate storytelling about the food and why the food is wasted. Evans (2014, p. 22) used a similar approach in his study of food waste in the UK, arguing that the method allows the researcher to follow the paths of food through different food-handling practices. Fridge studies are ethnographical in nature, consisting of an unstructured rummage in the kitchen that is led by both participants and researchers. Here, rummaging means that the participants and researchers stand together in the kitchen and talk about, touch and photograph food, tools and technologies. We argue that this unstructured approach toward food provides rich narratives about specific food handling that more structured inventories would not capture. The researcher’s role is here to ask performative questions about food handling (Halkier and Jensen, 2011), such as assessing whether the food items are still edible, how they have been used and whether there is a plan for future use. A specific food item is used to spur more general stories about food handling; the food that are observed in the kitchen during the visits are also elements of practices that have already been carried out: leftovers from today's or yesterday's dinner or the fruit purchased for making smoothies a few days ago. These remnants of performed practices enable insights into how the food was acquired and prepared, even though these actions did not happen during the visit.

Fridge studies can produce rich data consisting of the interconnectedness between talk and materiality, which is documented by audio recordings and photographs. The photographs

provide context to the talk, showing the actual food products (labels, packaging, storing, etc.) and their placement in the kitchen, as well as the layouts of kitchens, fridges and freezers.

2.1 Recruitment and sample

The data in the current paper stem from two research projects – CYCLE and FoodWaste¹ – both of which aimed at identifying food waste drivers and developing preventive measures. The data consist of 26 at-home visits to Norwegian households, which were all recruited by the recruitment agency Norstat. Previous research on food waste in Norway has identified young households and families with young children as wasting the most food (Stensgård and Hanssen, 2016), which is also similar to other European countries (Stenmarck et al., 2016). The sample was strategically selected to match these criteria to provide in-depth knowledge about why these household types generate a substantial amount of food waste; the current study's sample consists of six single households, six couples without children, six single parents and eight households with children living at home. Households that have historically been found to waste less, such as families with older children, middle-aged and older couples, were not included in this sample. The average age of the main participant is 33 years old (variation: 25–51), while the gender distribution is 12 men and 14 women.

There are several limitations to this sample. First, all the families live in Oslo or Akershus County, which are considered urban areas. We do not have data on families in rural areas, even though the current sample does include different dwelling types (from small apartments to large, detached houses). Second, the material was gathered in two different projects. The 10 visits from the CYCLE project were conducted from January to February 2015 and included a shop-along prior to the household visit. The 16 visits from the FoodWaste project were conducted from February to April 2017 and did not include a shop-along. The fridge studies method was being developed during these visits, meaning that all the interviews were not conducted in the same manner. The first 10 visits included a section where the researcher looked into the fridge together with the participant, while the 16 subsequent interviews had the fridge study as a main research component. However, both interview guides were based on performative questions, as defined above. See appendix 1 for a full overview of the sample.

¹ CYCLE (2013-2017), financed by the Norwegian Research Council
FoodWaste (2017), financed by the Norwegian Ministry of Children and Equality

2.2 Field studies and analytical strategy

Two researchers participated in all the visits, which included a short interview section (5–20 min) about food-handling practices, including planning and acquisition from different suppliers, food labels, food storage, cooking, eating and meals, portioning and special occasions, as well as food waste and environmental issues in general. The remainder of the visits were spent in the kitchen inspecting the fridge, freezer, cabinets and countertops. The researchers photographed the fridge and freezer and each item that the participants talked about. An average of 31 photographs were taken in each household (variation 7–77). The fridge studies did not include a systematic inventory of the fridge; rather, it was used as an initiator for the participants to tell stories about their own food and kitchens. The main performative questions were ‘Can you tell us about why you bought and how you are going to use this food item?’; ‘Can you assess this food item and decide whether you would eat it or not?’; and ‘How would you use this food item?’ The average interview length was 67 minutes (variation: 20–114 min.).

All interviews were audio recorded and fully transcribed, and the transcriptions were coded in themes and theoretical categories in HyperResearch – software for coding qualitative material such as texts and images – using the following overarching categories: planning, acquisition in store, alternative acquisition, shelf life, freezing, kitchen infrastructure, cooking, food categories, measures to reduce waste, priorities, norms, ideals and values and division of responsibility. Each overarching category with subcategories was analysed by grouping together similar narratives (e.g., the same food item, similar storyline of acquisition, storing, cooking or wasting, similar arguments of why an item was wasted or not, etc.) about food items to identify the context in which food is wasted, as well as contexts where it is not. The photographs were manually categorised as follows: type of food (e.g., vegetables and fruit, leftovers, bread, dairy, etc.); kitchen infrastructure (fridge, freezer, drawers and cabinets); labels and storage (boxes, bags, jars, etc.); package (type, opened); and shopping lists and themes (e.g., ‘the unpredictable’, ‘double up’ and ‘food projects’). This inductive coding process (from raw data to categories and then narratives) was the first step in the analysis and aimed at reducing the amount and complexity of the large amount of qualitative material. In the next step, the narratives were developed into processes to capture more general features of the material that are, to a larger degree, theoretically informed. In the following section, we present five food-handling practices found in the data that cause food waste and identify decisive

moments and contexts where prevention should be addressed. Furthermore, we discuss potential contextual measures inspired by previous intervention studies.

3. Decisive moments within food-handling practices for food waste prevention

In recent years in Norway, the issue of food waste and its scale has been communicated to the public through campaigns and the general media, which holds true for many other European countries. The findings from previous studies (Hebrok and Heidenstrøm, 2017) have indicated that these campaigns are increasing awareness of food waste as a general societal problem but not awareness of food waste being a problem within one's own household. Furthermore, what surfaced as particularly central to the participants in the current study was their wish to comply with their ideals of thrift and responsible management of resources, both in terms of their own financial management and their more overarching ideal of not being wasteful. Even though they possessed a large degree of knowledge about how they could avoid wasting food, they seemed to be unable to transform this knowledge into action within the practices of everyday life (Hebrok, 2018).

The present study illustrates how food is wasted in households when it falls out of the everyday patterns of food consumption. For instance, when it is purchased but not included in any dish in a reasonable amount of time and when it is prepared but not consumed. The successful consumption of food items acquired especially depends on how purchases and meals are conducted, planned and organised, on finding use-occasions for food, being familiar with food items and on the assessment of value, risk and quality. We define a 'use-occasion' as a fitting time and place for particular food items to be used in a dish or consumed as they are (as with some food products or leftovers). A situation needs to arise in time and space where particular food fits in.

In the following, we explore how food-handling practices cause food waste and identify decisive moments within these practices where contextual measures to reduce food waste could be implemented. Foremost, as a step toward bridging the gap between consumer awareness and knowledge regarding food waste, and their actual food-related practices and ability to implement food-waste-reducing measures in their everyday lives. Here, we identify five

practices related to food consumption that emerge from the present study, as well as from previous research (cf. Hebrok and Boks, 2017), as the most significant to food waste generation in households: (1) acquiring food by purchasing and planning for meals, (2) storing food, (3) assessing the edibility of food, (4) valuing food and (5) eating food by creating use-occasions and portioning.

3.1 Acquiring: planning purchases and meals

How consumers plan purchases and meals has been a topic of special interest in studies on food-waste-related practices. Southerton and Yates (2014, p. 135) pointed out that the overconsumption of food is the result of a ‘temporal mis-match between the rates and frequencies of food acquisition and food consumption’. A general conclusion in the literature is that consumers are not planning enough. Farr-Wharton, Foth and Choi (2014) distinguished between planners and improvisers, arguing that planners waste less. The improvising consumer seldom plans for shopping or meals, and the food products bought and meals prepared are a result of improvisation. Halkier (2009) illustrated how improvisers are seeing food preparation foremost as a pleasurable and social activity; they rarely plan shopping or meals but approach the task creatively by making use of what is at hand or by improvising on purchases in the store. By using what is at hand in a creative way, however, food waste can be avoided. Moreover, Evans (2014:42) found that ‘plans are often thrown out of balance by the rather more fluid nature of the ways in which lives are lived’.

Common advice for reducing household food waste has been long-term meal planning (Love Food Hate Waste, 2018; VG.no, 2016; WRAP, 2012), making weekly meal plans and buying groceries once a week for that plan. The current study finds that long-term planning can reduce flexibility in the provisioning and organisation of meals, thus generating more food waste than short-term planning – buying what you need when you need it. In the present study, the participants who practised more *flexible planning*, for instance, by planning meals 2–3 days ahead of time, were, to a larger degree, able to adjust to unexpected events that would happen during the week. One of the participants argued, ‘I think that being unorganised actually helps us waste less food, because we eat the food that has to be eaten, instead of deciding that we should eat this or that, or buy these things in advance’ (Man, 38 years old). Several participants referred to past events that revealed that when planning meals for a full week, more food would become superfluous: either it would not be put to use at all, or leftovers were wasted.

Consequently, we argue that what decides how much food goes to waste is not how meticulously purchases and meals are planned, but rather how flexible participants are concerning the use-occasions for particular items and their frequency of shopping. In essence, the participants who were somewhat spontaneous and irregular in their purchasing habits but purchased food items that they knew they could put to use in a variety of dishes seemed to waste less food than those who made meticulous plans but did not manage to follow through on them. Following these sorts of plans seemed to be next to impossible for most participants because of the unpredictable and constrained nature of everyday life.

Organising the events of everyday life is a never-ending task, and of course, planning is a necessary part of this effort. In looking for decisive moments within everyday practices to prevent food waste when planning, we find that the new food provisioning services could play a useful role. The use of these services may contribute to a reduction in food waste by making it possible for consumers to check their stock as they are shopping for new groceries online (online grocery shopping) and by streamlining the use and portioning of food (box schemes). Additionally, they could potentially reduce overbuying, overportioning and the amounts of food left in storage and not consumed. One participant talked about how she used an online grocery store: 'I have stored a list there called "basics" where I have butter, milk, coffee, toilet paper, all the stuff that you need on a regular basis. Then I have made separate dinner lists for different dishes, and sometimes I use the recipes at the website, as well as a blog' (Household 14, Woman, 39). The participants stated that they often forgot what they already have at home when in the store or did not know how to combine the food they had into a dish. Encouraging consumers to shop for food with long shelf lives online and to buy easily perishable food items more frequently can be one approach to increase flexibility in consumers' provisioning practices and, thus, help reduce food waste. For fresh foods, flexible planning is crucial. This kind of strategy can be made attractive by communicating the possible benefits, such as avoiding heavy shopping bags, saving money and more. In cities with a high degree of retail density, this is obviously a more relevant strategy than in rural areas.

Similarly, box schemes have some of the same potential for changing the practices of food provisioning, along with cooking practices, because the food is already portioned. However, the participants found that using a box scheme reduced flexibility within their everyday lives and that some of the food did not fit – either because they did not like it or because they found no use-occasion for it, which is exemplified in the quote shown in figure 2 below.

[Figure 2 here]

Thus, we assume that the potential of box schemes to reduce food waste could be amplified by reducing the use of unfamiliar food items, increasing flexibility in ordering and cancellation, differentiating between servings for children and adults and including tips for alternative use-occasions for the food items.

3.2 Storing: the fridge and freezer as keepers and destroyers

Evans (2012) talked about the refrigerator as ‘an active participant in the process of devaluation and decay’. Storing fresh food and the long-time storage of frozen foods in households can be made possible through the refrigerator and freezer, respectively, and these technologies play a central role in how food is handled in the home. They enable people to purchase larger amounts of food than they intend to eat or store the food at home for different use-occasions. Nevertheless, when parts of this food cannot find a use-occasion, they go bad and are wasted. The quote shown in figure 3 below illustrates that the freezer is also used for storing food that will eventually be wasted.

[Figure 3 here]

The participants in the current study explained how food ending up in the back of the refrigerator is often wasted. The same goes for vegetables at the bottom of the vegetable drawer and jars forgotten in the fridge door, all of which are examples of food that lost a use-occasion. Moreover, leftovers are kept there in the hopes of someone being tempted enough to eat them, but all too often, they are tossed as soon as the food is spoiled. In this way, the uncomfortable feeling of wasting is reduced. We find that the participants’ kept products ‘at mercy’ (Klepp, 2001) in the fridge, meaning that these products were no longer desirable and were being left at the back of the fridge to expire and then be thrown away (see also: Evans, 2011; Porpino et al., 2015). The quote shown in figure 4 below is an example of how food moves through the fridge during its different stages, from edible and desired to nearly waste.

[Figure 4 here]

What seems to be causing some of these leftovers to be thrown out is that many people are not restricting themselves to eat what is currently in the fridge; rather, they focus on what they desire to eat at the moment (Baker et al., 2009).

The most important feature of the refrigerator today is its ability to maximise shelf life; however, there may still be untapped potential for using the refrigerator to reduce the uncertainty of shelf life and create more use-occasions. The traditional design of the refrigerator with shelves and a vegetable drawer does not provide a sufficient overview of the available food items. Furthermore, location and size matters greatly in how food stored in freezers is handled. In our fieldwork, we discovered a difference between households that owned a combined fridge and freezer and households with separate units. The large freezers gave little overview of the stored foods; they were often stuffed and contained items that had been stored in them for several years. Households with limited space in the freezer were more conscious in how the space was used. Furthermore, in the households where the fridge and freezer were both located in the kitchen, the freezer was more actively used to prolong the lifespan of some food items by moving them from the fridge to the freezer. Additionally, the freezer was actively used for portioning items, such as portions of bread, vegetables and leftovers, that the families consumed daily.

Interventions aimed at the fridge have been developed in various fields. Scholars within human-computer interaction have been engaging in developing fridge concepts that could reduce food waste. The ZmartFri technology is an intelligent fridge concept that includes an expiration date alert and automatic shopping list (Bucci et al., 2010). ‘Colour Coding the Fridge’ is a concept that aims to help people organise and keep track of a fridge’s contents (Farr-Wharton et al., 2012). An eat-first prompt was tested in the ‘Food: Too Good to Waste’ campaign by the U.S. Environmental Protection Agency (EPA), and this programme entailed a sign being placed on a shelf in the fridge (EPA, 2016). It remains to be seen how these types of concepts may contribute to reduce household food waste. The challenge lies in how the complexity of factors related to the organisation of everyday life, preferences, experiences and uncertainties affect how food is handled. The HomeLab project has sought to address this complexity from a practice perspective, and among other interventions, there has been experiments with ‘fridge triage boxes’ that are supposed to aid participants in circulating food appropriately in the fridge (Devaney and Davies, 2017). A simpler, but perhaps more effective

suggestion, is having a smaller fridge to reduce the amount of food that could be left forgotten in the back and in large drawers (Foden et al., 2017).

We argue that there is great potential in designing refrigerators and freezers differently to reduce food waste; the goal of these designs should be to increase visibility, trigger use-occasions and reduce uncertainty regarding edibility. Thus, how a fridge and freezer can be designed to enable better food-handling practices should be more thoroughly explored. Integrated storage solutions and tools for measuring shelf life would, for example, make it easier to keep track of a fridge's contents, increase food shelf life and reduce uncertainty.

Moreover, packaging may be able to play a more central role in household food storage than it presently does, and this can be accomplished by redesigning packaging to the way food is handled at the consumer stage. This could focus on more accurate portion divisions, visibility, stackability and so forth. Wikström et al. (2018) argued that there is a lack of packaging designs that take into account the functional needs for the whole life cycle of food products. Furthermore, the desired practices related to food packaging can be made default through design, suggesting this is a topic for design research within the field of design for sustainable behaviour.

3.3 Assessing: food quality and safety

Reducing food risk and food waste are efforts that often come into conflict (Watson and Meah, 2012), and there is a need for coordinating messages to the public about food waste and safety (Foden et al., 2017). According to Neff, Spiker and Truant (2015), date labels and sensory assessments are the most practised ways to judge edibility. Parizeau, von Massow and Martin (2015) showed that the more strategies to assess edibility are used, the more food is wasted. Those relying on only one or two strategies, for instance, visual assessment and smell, seem to waste less food. Assessments of food are influenced by emotions and care-taking responsibilities (Brook Lyndhurst, 2007). Avoiding risk and ensuring food safety for oneself and one's family members is a priority over avoiding food waste (Evans, 2011; Farr-Wharton et al., 2014; Graham-Rowe et al., 2014).

The participants in the current study were continuously assessing the level of risk their food posed to their health, as well as the pleasure of eating, before deciding on the edibility of the food. Both the risk of getting ill and the risk of experiencing disgust when eating spoiled

food seemed to be equally important for the participants to control. The current study shows that insecurities about risk assessments often lead to food waste. The participants mainly based their decision on whether a food item is edible or not on two types of knowledge: (i) *institutionalised knowledge and explicit rules* that consist of explicit and theoretical knowledge such as date labels, written information from authorities, media, non-governmental organisations (NGOs), and so forth and (ii) *know-how and embodied habits* that consist of sensory evaluations, such as seeing, smelling and tasting, along with previous experiences with similar foods (Gram-Hanssen, 2011). Generational aspects and upbringing seem to be central to the kind of embodied knowledge a participant possess, for example, whether they were brought up or have lived in rural areas in close connection to food production. Nevertheless, most of the participants described insecurities related to both these types of knowledge, especially when used together. For example, is the date label correct if the packaging is broken? How long can the food be stored? What types of changes in appearances, texture, smell and taste are safe? The way in which the participants drew on institutionalised and embodied knowledge to assess if a food item was still edible varied between different sorts of food items. The quote shown in figure 5 below illustrates how these negotiations between institutionalised knowledge and embodied knowledge can be expressed.

[Figure 5 here]

In some cases, knowledge about how to assess food safety and quality is transferred from one sort of food item to another. Sometimes, this can be problematic, for instance, when one of the participants stated that she would eat chicken past the best before date because she knew that most food is generally still edible past the date. In this case, her embodied knowledge that food often lasts past the expiration date, as well as her attempt to see and smell if it was edible, made her put her health at risk by eating chicken that could be infected with microbes.

Previous research into the effect of date labelling on household food waste has shown that the current date labelling systems are confusing to consumers (Wilson et al., 2017). In Norway, similarly to other European countries, there are two kinds of date labelling: *use by* and *best before*. European studies have found that consumers are confused by the different labelling systems, and some countries have reduced how many systems there are to clarify how they work (WRAP, 2011). Likewise, the current study shows that although most of the participants knew the difference between the two labels, the date – independent of the text preceding it (best

before or use by) – is a trigger for food waste. Date labelling seems to contribute both to an increase and reduction in uncertainty about food risk and quality. This uncertainty is mostly connected to what the participants feared may not be perceptible (microbes and pathogens) or to one's own ability to assess an acceptable degree of change in quality (consistency, colour and odour). Furthermore, the participants challenged the date labelling system by implementing their embodied knowledge (sight, smell and taste). These negotiations created a dynamic between the two systems, leading to food waste from uncertainty.

We argue that the decisive moments for intervening into these processes of risk and quality assessment are mainly related to two contexts: packaging and the grocery store. By redesigning packaging and labelling, along with tailoring communication and training in grocery stores, these insecurities about food risk and quality may be reduced.

Date labelling is still the prevailing way of providing consumers with information on shelf life, food quality and safety. However, new technologies are being developed to provide more accurate indicators of shelf life. 'Keep-it' is a Norwegian innovation that monitors storage conditions and how these conditions impact the food inside the packaging, showing how many days are left of its shelf life through a timeline (Keep-it, 2018). Mimica Touch, a British innovation, is an intelligent label that becomes bumpy when the food inside the packaging has gone bad (Mimica Touch, 2018). To avoid food waste caused by insecurities connected to date labelling, it is crucial to develop alternative ways to indicate shelf life and support consumers in their own assessments.

Uncertainty about the edibility of food is not only affected by date labelling, but also by the design of the packaging. The participants in the current study were especially critical of liquid food in glass or metal jars and tubes, where it is difficult to observe changes in colour and texture. Given the limited surface available for information on packaging, as well as the consumer's limited susceptibility to this information, it might be useful to examine how the shape of the packaging can help reduce the uncertainty associated with opened packages (e.g., packages with a set of sealed portions).

Another opportunity to aid consumers in their sensory assessment of food could be in the store, preferably through positive rather than moralising messages. The aim would be, as with packaging, to convey knowledge to consumers in the moment of reflexivity that occurs when buying food. Visual representations of quality changes that are acceptable and different uses

for food in different ‘phases’ (e.g., sour milk) would be helpful for consumers to take home. It is important that the communicated knowledge that is internalised over time is activated at the moment of reflection — that is, when the consumer is holding a product in his or her hand, wondering what to do with it, or is looking into the refrigerator to see what can be made for dinner.

3.4 Valuing: perceiving the value of food

The plentitude of food accessible at low costs affects how food is valued, and although reducing the availability of food and increasing prices would most probably reduce food waste, this cannot be seen as an option (Aschemann-Witzel et al., 2015). Age seems to be an important variable in how food is valued within various consumer groups, with people over 65 years of age wasting less food than younger groups (Quested et al., 2013; Stensgård and Hanssen, 2016). According to Mavrakis (2014), different forms of value, such as monetary value, novelty value, resource value and the value of social relations influence disposal decisions.

In the following, we highlight three forms of value attributed to food – in addition to monetary value – that we find are causing food waste. Similar to Mavrakis (2014), we have differentiated between the values using our empirical findings. This differentiation serves as a way to pinpoint important aspects of the practice of valuing food. Furthermore, this will help relate forms of value to decisive moments of opportunity for food waste prevention. Previous studies have mentioned similar values but have not differentiated them in the same way because these values have been presented in other contexts (e.g. Evans, 2014; Mavrakis, 2014).

The current study shows that the participants were evaluating food according to the various perceptions they had of these different forms of value. The type of value that gained the most attention was monetary value. The share of household income spent on food in Norway has steadily declined over the last decades, dropping down to the current 12% (SSB, 2005, 2012). This means that on average, food is relatively cheap for most Norwegian consumers. Not surprisingly, the current study shows that if a food item is considered to be of low value, it is more often wasted than food items that have a high perceived monetary value. Monetary value is important here; expensive foods, such as meat and fish, are less frequently wasted than cheaper foods, such as vegetables and bread. However, the current study identifies three additional forms of value that seem to influence food waste in households. First, we find that the perceived value of food can be influenced by the degree of its utilisation – *a utilisation value*

– meaning that when a product is partially used, it is easier to waste than an untouched, new product, as exemplified in the quote shown in figure 6 below.

[Figure 6 here]

Packaging divided into smaller portions, for instance, might preserve the food's utilisation value better than larger packs of food items because these smaller portions will keep the food aesthetically appealing and fresh after being consumed piece by piece. However, portion packs are often criticised for the extra amount of packaging used and their environmental impact, which must be weighed against its potential waste-preventing effect.

Second, there is value influenced by relationships, time and effort – a *relation and time value* – meaning that homemade food, made either by friends and family or oneself, along with food that takes time and effort to prepare, is less frequently wasted than ready-made foods, as exemplified in the quote shown in figure 7 below.

[Figure 7 here]

Value connected to relationships and social interactions to some extent is being promoted through marketing campaigns for food products, simply by creating ads that show the products placed in a meal setting, such as a family dinner or dinner party with friends. However, this is a projected value, not one attributed to personal relationships, nor to the time and effort spent on preparing a meal. Thus, it is a challenge to imagine interventions that can effectively recreate this personal effect. Encouraging people to spend more time cooking or to bring more food as gifts seems counterproductive.

Third, the *quality and taste value* matters a great deal because foods with a high perceived quality nutritionally or in terms of freshness (e.g., fresh food ingredients, meals cooked 'from scratch' and organic food) and taste are less frequently wasted than low-quality foods (e.g., processed food and less fresh food), as exemplified in the quote shown in figure 8 below.

[Figure 8 here]

For instance, increasing quality and taste attributes could be achieved through policy measures that put pressure on the food industry to deliver better products. Some producers that already provide premium quality products could perhaps improve the marketing of their products to convey this value to consumers.

This differentiation into three additional types of value – in addition to monetary value – indicates that there is a potential to increase perceived value in other ways than by increasing food prices. To reduce the food wasted as a result of value, it is imperative to explore ways to increase the perceived value of food, which can perhaps be done through industry regulations, marketing efforts, popular media, training and education in schools and new provisioning platforms where the producer and consumer develop a closer relationship. Increasing the value of food, hence, does not necessarily need to be done by increasing the monetary value, but rather by attributing values related to quality, taste, social interaction, caring and use-occasions to food products.

3.5 Eating: finding use-occasions and portioning

Evans (2012, p. 45, 51) explored how food waste is a result of ‘a mismatch between the rhythms of everyday life and the temporalities of food, (...) between the ways in which food is provisioned and the ways in which lives are lived’; he argued that food waste occurs as part of the practices with goals not related to food waste. Southerton and Yates (2014) identified the contexts and the social organisation of meal occasions to be especially important in predicting food waste. Similarly, the present study found that not only is it important to study the effects of the practices related to meal occasions, but also how the ability to find *use-occasions* for the purchased food is an important part of organising meals and avoiding waste. In the current case, this seemed to be easier for the participants who were not buying large amounts of food but were instead buying what they knew they would eat in particular dishes the following days. Moreover, the participants who planned to use the same, familiar ingredients in several meals were generally more successful in putting all the food to use than those who tended to experiment more with unfamiliar ingredients and who planned very different dishes from day to day. The food items that were intended for specific use-occasions that never occurred in some cases could become superfluous because no new occasion was looked for or found, as exemplified in the quote shown in figure 9 below.

[Figure 9 here]

We argue that the purchasing food items that are strongly linked to intended meals or projects or to particular practices of meal preparations and organisation is, in many cases, a producer of

food waste because these foods are difficult to transfer from a specific dish to a new use-occasion.

The current study shows that food waste often occurs when consumers handle food items that they are unfamiliar with, either that have been given to them as gifts or purchased as ingredients for a particular dish. We find that the food items that participants were able to apply to a small variety of use-occasions were wasted more frequently than items applicable to a large variety of use-occasions. This applicability depends on the person's knowledge, skills and routinised food practices. Food items we have characterised as *unfamiliar* – meaning that the participants were not used to eating them and incorporating them into meals – are resistant to domestication (Silverstone, 2006) into the everyday running of meals and are thus more often wasted, as exemplified in the quote shown in figure 10 below.

[Figure 10 here]

Finding a use-occasion for the food was the first step toward a making a meal, but then during preparation, portioning surfaces as the next challenge the participants faced. The participants found it quite difficult to portion accurately for meals and regularly cook more food than what was consumed. Cooking the right amount is a demanding task because it is difficult to assess how much household members will eat on a particular day. One of the participants talked about how she could be better at portioning in her family: 'It had to be if the kids were better at eating the food they are served. Or that I would be better at finding the key to portioning for them, being good at knowing how much they eat at certain times' (Household 8, Woman, 43). Much like assessing food safety and quality, portioning is a practice consisting of (i) *institutionalised knowledge and explicit rules*, such as recipes and information on packages, and (ii) *know-how and embodied habits*, such as knowing how much each family member usually eats and how to compose a meal with different amounts of ingredients. The institutionalised knowledge or estimation of how large one portion of rice is, for instance, that is printed on the back of the packaging may not always correspond with how much family members will eat, which makes embodied knowledge just that more important. Families with young children struggle with the ever-changing appetites and preferences of their children, and single households are not able to consume all the food that is prepacked in large portion sizes. Moreover, a strong cultural norm of serving (more than) enough food and the fear of not being perceived as offering an abundance on special occasions and weekends contributes to overestimating the required portions for

meals. According to the participants, this ideal was also present during weekday meals, though not to the same extent. In addition, the store represents a material infrastructure consumers interact with regularly, on average three to four times a week in Norway (Forbrukerrådet, 2016). Thus, this is a context that has a great deal of potential to make an impact. The combination of material and informational interventions has proven to be influential on purchasing choices (Devaney and Davies, 2017). Thus, we suggest combining knowledge and awareness campaigns with material and structural measures in the store, such as using product placement and product-specific information and tools in context (on shelves or displays). To make consumers more aware of the various use-occasions of food items, these use-occasions could be communicated in stores by placing items next to each other and having corresponding recipes and information nearby. A variety of use-occasions for food items and more flexible portioning strategies (adjusted according to, for instance, gender, age, etc.) could be presented on packaging and in stores. Moreover, portion control tools could be distributed, as applied in the HomeLab experiment (Devaney & Davies, 2017). The main focus should be to convey knowledge and offer tools to increase use-occasions and to portion more accurately in a way that can be internalised by the consumer, hence being activated when handling the food item again at home.

4. Discussion and Conclusions

In order to address the insufficiency of current policy efforts towards reducing household food waste, we discuss new ways of approaching the problem. We argue that the current focus on information and awareness campaigns is failing to produce large scale results because it is a strategy that does not target important everyday practices influencing food waste levels. Albeit, consumers may become more aware and knowledgeable about the issue, this does not result in major changes in practices. The reason is that they are intertwined in a web of interlinked practices making up the everyday life activities, infrastructures and meanings of consumers. Interventions must therefore be targeted at the appropriate contexts to make a difference.

Thus, in this article, we have argued for a more contextual approach toward food waste prevention as part of the ambitions of the EU's goal of developing a circular economy. Based on the findings, we emphasise the importance of targeting the contexts of everyday food-handling practices related to households and identify the decisive moments where food waste

prevention measures should be implemented. In figure 11 below, we summarise our findings and illustrate the connection between everyday food-handling practices and food waste in households. Moreover, we include how these practices contain decisive moments for food waste prevention.

[Figure 11 here]

Our main argument is that the measures to reduce household food waste need to be implemented in connection to the actual food-handling practices that are causing waste – these measures need to be *contextual*. In doing so, the goal is to change these measures in a way that changes the mundane practices in everyday life that lead to food waste. We have focused on five practices that have emerged as especially significant to the generation of food waste: 1) acquiring: planning purchases and meals; 2) storing: the fridge and freezer as keepers and destroyers; 3) assessing: food quality and safety; 4) valuing: perceiving the value of food; and 5) eating: finding use-occasions and portioning. Furthermore, we explored how the material infrastructure of food-handling practices, as well as the materiality of food products themselves, can represent opportunities for food-waste-reducing interventions by targeting products (food, tools), packaging, technologies (fridges, freezers, shelf-life indicators) and infrastructures (store structure, forms of procurement). In an attempt to apply our insights to concrete interventions, we have discussed the role of these material structures within the described practices and what sort of interventions might be fruitful to further explore, develop and evaluate.

Our study contributes to the existing food waste literature by providing insights into food-waste-related practices. The novelty of our contribution lies specifically in the identification of decisive moments and contexts where preventive measures could be successfully implemented. In this way, we add to the emerging literature focusing on applying insights on practices to the discussions of interventions and food waste prevention. We argue that this strand of research is imperative to support future efforts to address this important area of food waste prevention within the European Circular Economy Action Plan (European Commission, 2015).

Two limitations to be noted are as follows: 1) our account of food-waste-related practices is our interpretation of the empirical data retrieved from our ethnographic fieldwork and is not based on exact measurements of food waste quantities within the visited households,

and 2) the contextual measures discussed have not been evaluated or tested but are merely provided as examples of potential starting points.

We hope that future research and policy development will engage in how contextual measures may be created and put to use in measuring the effect of such measures. Although we argue for a contextual approach, we acknowledge the need for raising awareness on the magnitude of the food waste problem. Notwithstanding the above, we argue that this is not sufficient to change consumer habits; contextual measures must be added as well. Furthermore, we acknowledge that efforts have already been made within the contexts described, but what we see lacking is a comprehensive systems approach addressing structural changes from multiple angles, constructing systems with a larger impact than the lone components these systems consist of. To achieve this, a multistakeholder approach is required, including stakeholders from various industries, the government, social research, and NGOs.

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