

Challenges of food waste reduction:
A survey on the food waste reduction practice
of Wageningen University students

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Abstract

The Dutch government is committed to reaching the target of halving per capita food waste at the retail and consumer level and reduce food losses along the food production and supply chains by 2030 (SDG 12.3). However, there has been little decrease in the amount of food waste in the Netherlands from 2019 and the task of reducing food waste has grown more and more challenging. This study takes this issue as its starting point. Through studying and analysing the food consumption behaviours of a group of students from Wageningen University, I aim to identify the factors that influence consumers to reduce food waste and to explore possibilities for further food waste reduction. Diaries and interviews were combined to conduct the empirical investigation. The study utilised the social practise theory to look into customer behaviours that lead to and prevent food waste, taking into account the complex nature of food consumption practises. Applying the material, competence, and meaning—the three elements of social practise theory—I developed a number of influential components from the narratives and recordings of the participants. However, the results of the study were not strong enough to support conclusions about which factors have a greater impact on consumer practice to reduce food waste. The results obtained from this study are still insufficient to assist in the formulation of further policy initiatives to encourage food waste reduction in the Netherlands, given the complexity of food waste itself and the complexity and unpredictability of consumer behaviour.

Key Words:

Food Waste, Food practices, Practice theory, Food policy, Consumer behaviour

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1. Introduction

1.1 problem statement

1.1.1 Food Waste

Food waste is an important and pressing issue for sustainable development (Keegan & Breadsell, 2021). Because of the resource-intensive nature of food production (Schanes et al., 2018), food loss and waste results in extensive food security, economy and environment impacts (Ishangulyyev et al., 2019). The amount of food waste varies by country and is influenced by factors including affluence, urbanisation, and economic growth (Chalak et al., 2016). In less-developed countries, food waste mostly happens during the post-harvest and processing stages due to poor practices, technical and technological limitations, labour and financial constraints, and a lack of proper transportation and storage facilities (Gustavsson et al., 2011). For developed countries, including Europe, about 40% of food waste happens at the consumption stage (Gustavsson et al., 2011), which is driven mostly by consumer behaviour, values, and attitudes (Meacham et al., 2013). A large portion of the food waste occurs after preparation, cooking, or serving, as well as from not consuming before the expiration date as a result of over-shopping, which might be associated with poor planning and bulk purchasing (Meacham et al., 2013).

Food waste can be defined as food leftovers of raw and processed foodstuffs, waste from agricultural production, food processing, retail and wholesale, cuisine of bulk consumers and private households (Richter, 2017). In some studies there is a distinction between 'food waste' and 'food losses' on usage and demarcation (Gustavsson et al., 2011). The term 'food loss' is often used to describe losses earlier in the supply chain, or those related mostly to the lack of infrastructure and access to market, and the term 'food waste' is often used to describe losses later in the supply chain, or those related to the behaviour of different actors (Bajželj et al., 2020). In the studies of Ponis et al. (2017) and Richter (2017), food waste and food losses are not distinguished to facilitate the understanding of survey participants and the collection of data. Considering that the survey participants in this study are consumers, they may have less awareness of the distinction between food loss and food waste. Therefore, this study adopts the approach of Ponis et al. (2017) and Richter (2017). In the following, food waste comprises all food and drink rests occurring along the food supply chain, especially during the procurement and home processing process. This definition will be provided to the participants at the beginning of the survey.

It is common that more food is purchased than needed and used (Evans, 2012) but consumers do not go shopping with the intention of wasting food (WRAP, 2006). Some believe that the amount of food wasted can be explained by consumer unawareness of environmental damage. And then continue: others argue that consumers experience difficulty in assessing household food availability. (Quested et al., 2011). The assessments

of their own household food availability may distort purchasing decisions, causing them to buy too much food and leading to spoilage and sorting (Chandon & Wansink, 2006). Scholars have divided food waste further into three types: avoidable, possible or partly avoidable and unavoidable food waste (Lebersorger & Schneider, 2011; Parfitt et al., 2010). Consumers often think that their food waste is not avoidable. Moreover consumers tend to underestimate the amount of food waste (WRAP, 2006). In their perspective they only throw away non-edible parts like peelings or cores which they do not recognize as food waste (Richter, 2017). But more likely, food is discarded after preparation, for example, remaining food on plates (Richter, 2017). Thus, a lot of food gets wasted due to household processes in connection with everyday eventualities (Evans, 2012).

Considering demographic factors, younger persons waste higher amounts of food than older persons (Hamilton et al., 2005). Single women waste the highest amounts of food per capita and food waste is higher in households where women are in charge of food purchases (Koivupuro et al., 2012). When it comes to household size and income, food waste decreases with increasing household size on a per capita basis (Hamilton et al., 2005; Baker et al., 2009; Koivupuro et al., 2012) and increases with rising income (Baker et al., 2009; Cox & Downing, 2007; Parfitt et al., 2010).

The UN Food and Agriculture Organisation (FAO) reported that approximately one-third of all food produced for human consumption (1.3 billion tons of food for consumption) is lost and wasted throughout the supply chain each year (Gustavsson et al., 2011). While in the EU 129 million tons of food which is around 20% of food produced is lost or wasted (Lopez et al., 2020), about 33 million people cannot afford a quality meal every second day (European Commission, 2023a). Therefore, reducing food waste is considered to be one of the key points in coping with climate change, feeding growing world population and sustainable food system transition (Lieshout & Knüppe, 2023).

Meanwhile, the issue of food waste has been a high concern of the government, non-governmental organizations, academics and the public. In 2015, the United Nations adopted Sustainable Development Goals (SDG) designed to serve as a "shared blueprint for peace and prosperity for people and the planet, now and into the future". SDG Target 12.3 proposed to half per capita food waste at the retail and consumer level and reduce food losses along the food production and supply chains by 2030.

1.1.2 Reduction challenges in the Netherlands

The Dutch government has confirmed its commitment to achieve SDG12.3. For Dutch consumers solid food waste in 2015 was estimated at 43.3 kg per person per year. Halving that by 2030, would imply that per person a maximum of 21.6 kg can be wasted per year.

The Ministry of Agriculture, Nature and Food Quality released a report on Dutch household food waste in 2022 (Voedselverspilling bij consumenten thuis in Nederland in 2022). This study, coordinated by The Dutch Nutrition Centre, Het Voedingscentrum, was set up to monitor the progress of achieving sustainable development goals. Based on this

report, solid food waste in the Netherlands has fallen dramatically since 2013. Compared to 2015, the amount of food wasted per person per year in 2022 had decreased by 23%.

According to this report, in 2022, the average waste of solid food in Dutch consumers' homes was 33.4 kg per person per year. This is 8.9% of the total amount of food bought. The five most wasted product groups are bread and pasta (6.2 kg), vegetables (4.4 kg), fruit (4.3 kg) potatoes (2.8 kg) and dairy (2.8 kg). Compared 2019, bread and pasta and dairy were less wasted, but fruit and vegetables were more.

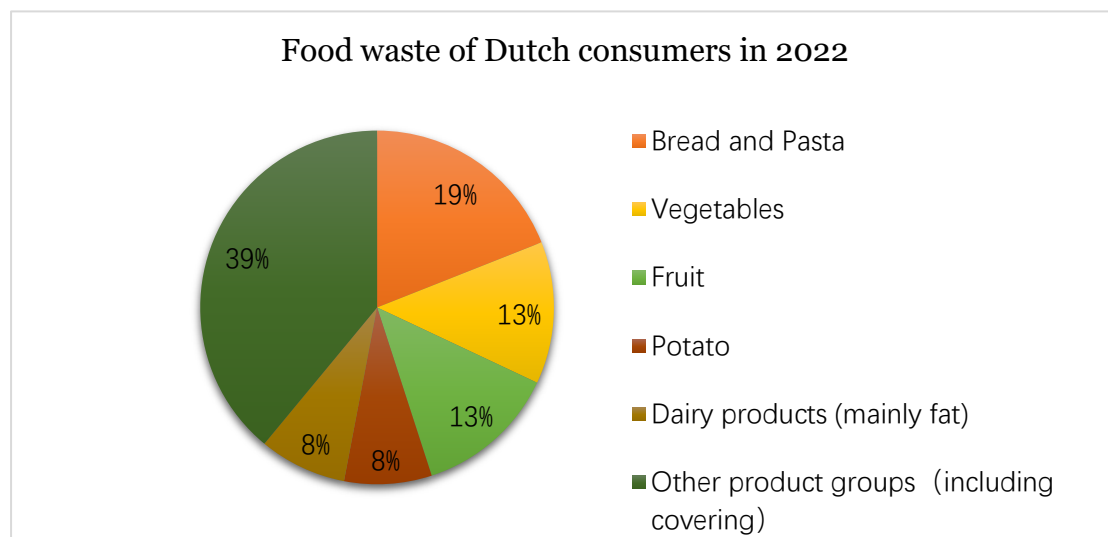


Fig.1.1.2-1 Food waste of Dutch consumers in 2022

In 2018, the foundation Food Waste Free United Foundation, Samen Tegen Voedselverswilling (STV) has been established to achieve the halving goal in the Netherlands. STV developed a national food waste prevention agenda. Companies in the food chain and consumers are its main target groups. Its key ambitions are to establish a positive social norm for consumers and companies, in which food waste is not desirable. The Foundation contributes to the national food waste prevention agenda by: monitoring progress; joining forces to combat food waste across the food supply chain; joining forces to combat food waste by consumers; and changing the rules.

Within this foundation, companies, organisations, government and knowledge institutes join forces to combat food waste throughout the system. One of the foundation's supporting institutions, the Voedingscentrum, directs STV's consumer-related activities. The Ministry of Agriculture, Nature and Food Quality (LNV), another supporting body, is responsible for funding these programmes. Collaboration is based on voluntary agreements.

The government has taken a series of measures to strengthen this voluntary agreement, including an annual budget of 1 million euros to help increase the reach and impact of food waste prevention awareness campaigns aimed at consumers and companies (European Commission, 2023b). According to a report from WUR (Bos-Brouwers et al., 2023), the action principles and methods of the current multi-factor and multi-level cooperation

platform are effective in starting and promoting the reduction of food waste.

As can be seen from historical data, the Netherlands has made great achievements in reducing food waste. However, many official reports and observations (Bos-Brouwers et al., 2023; Lieshout et al., 2023; Lieshout & Knüppe, 2023) show concern about the possibility of achieving the goal in 2030. The reduction of food waste has slowed down significantly since 2019. The amount of food waste observed in 2022 was only 0.9 kg less than that in 2019. If the rate of food waste reduction remains stagnant, it will be very unlikely to achieve the goal of reducing food waste by 50% in 2030.

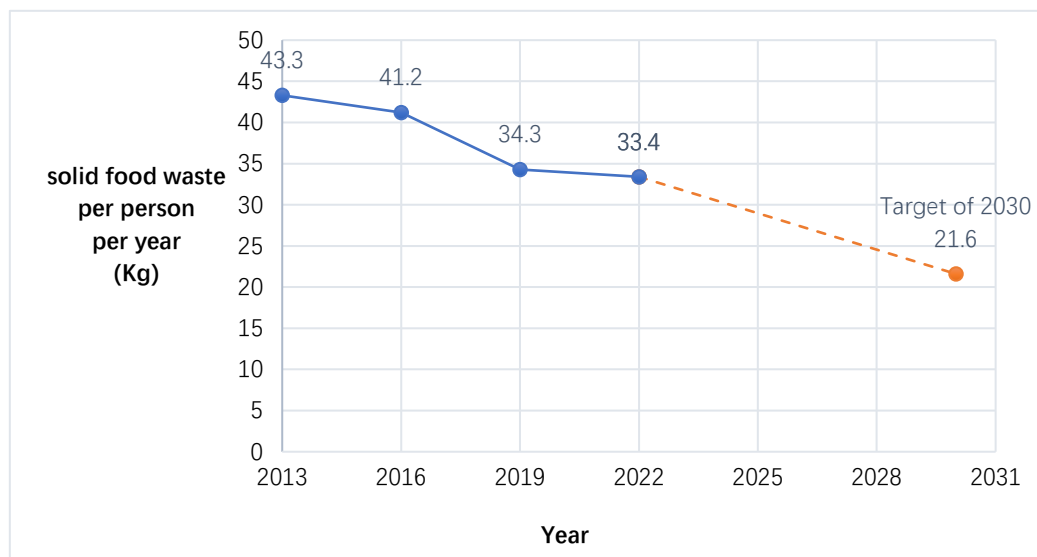


Fig.1.1.2-2 Trend of solid waste by the year in the Netherlands

According to the report, the possible explanation for the potential stagnation is still inconclusive. One possible explanation is that with the decrease of food waste, consumers need to make much more effort to continue the reduction. Another possible explanation is that consumer habits have hardly changed during the period of rapid decline of food waste (2015-2019), and the reason for the decrease in food waste is the development in the social environment or food processing industry. Based on the assumption and inspiration given in this report, I believe the knowledge gap is the gap between the motivation for food waste reduction and what people do in practice. This study is going to further scrutinize consumer habits to better understand the entry points for change.

1.2 Research aim

The study aims to find out the barriers which people experience in reducing food waste. What explains insufficient action? It does so through analyse the food habits of a group of students.

This study begins with the assumption that simply giving consumers information is not enough. Consumer awareness of sustainable living and minimising food waste does not

always convert into action. The aim of scrutinizing 'wasting food' as a practice is to better understand how a particular group of consumers deals with food consumption and food waste in daily activities and routines. Social practice theory will be applied to do the research. Social practice theories take practice as the smallest unit of analysis. Practices are defined as "a temporally unfolding and spatially dispersed nexus of doings and sayings" (Schatzki, 1996) and individual behaviours are performances of social practices (Spurling et al., 2013).

This means that focus is shifted away from market choice and individual decision making to what people actually do. For the main knowledge gap between people's motivation and what people do in practice, the analytical framework of E. Shove et al. (2012) is going to be applied. This framework starts from the idea that social practices are made of three elements: material, competence and meaning. In this perspective the practice of food waste can be separated in three elements which enable for studying what role: Material, Competence and Meaning play in this practice and how they constrain students to reduce food waste.

By investigating how this group of students generates food waste, this study tries to get a better understanding of this value-action gap and its causes, and also tries to find points of entry for potential change.

1.3 Research question

The main research question is:

What are the factors that influence people to generate and reduce food waste in their daily practice?

To answer this question, some sub research questions can be formulated:

- 1) What knowledge and skills (Competence element) do these students have to reduce food waste?
- 2) What kind of objects, tools and infrastructures (Material element) promote or limit these students to reduce food waste?
- 3) What experiences or opportunities led them to develop a sense of reducing food waste (Meaning element)?
- 4) What role do these elements play in students daily routines? And what does that tell us about entry points for change?

2. Conceptual framework

2.1 Theoretical perspectives on food waste

Consumers' food waste behaviour has drawn the interest of many scholars in different disciplines. According to a review of research on food waste by Schanes et al. (2018), the Theory of Planned Behaviour and the Social Practice Theory are the two main theories to study food waste practices.

The Theory of Planned Behaviour (Ajzen, 1991) is the main framework used in investigating food waste in the field of consumer behaviour (Schanes et al., 2018). Following this theory, individual behaviour is determined by the intention to perform the respective behaviour, and thus, the motivation and willingness to act (Ajzen, 1991). Many studies employing this framework provide large-scale findings and establish causal relationships between cognition and actions (Schanes et al., 2018). Some studies on food waste have indicated that a higher intention to reduce food waste is significantly related to a smaller amount of food waste (Graham-Rowe et al., 2015; Visschers et al., 2016). However, it is also found by some researchers that even if people have a strong intention to reduce food waste, this will often not be translated into action (Stefan et al., 2013). Stefan et al. (2013) explain that by the fact that the creation of food waste is not driven by conscious intentions and that food-related behaviour are family practices. And common explanation for the weak relationship between intention to reduce food waste and action is the "attitude-behaviour" gap (Vermeir & Verbeke, 2006) or "value-action gap" (E. Shove, 2010). The 'value-action gap' has been defined in generic terms by the Sustainable Development Commission (2006) as 'the observed disparity between people's reported concerns about key environmental, social, economic or ethical concerns and the lifestyle or purchasing decisions that they make in practice'. People express strong support for environmentally sustainable policies, but display little commitment to alter their own behaviour. Therefore, cognitive aspects such as attitude, intention and motivation are not good indicators to reduce food waste (Schanes et al., 2018).

Many scholars in the sociology of consumption build on social practice theory in their study of consumption (Cappellini & Parsons, 2012; Evans, 2011, 2012; Ganglbauer et al., 2013; Graham-Rowe et al., 2015). Social practice approaches relate behaviour to broader elements that are not directly within an individual's control (Evans et al., 2013) and frame food waste within the social world, rather than define food waste as an individual problem or as an externality. Analysing the food waste problem from a practice theory approach allows to move beyond individual psychological factors such as attitudes, behaviour, or choice (E. Shove, 2010) and provides insights into the intersection of various activities, actors, materials, spatial-temporal elements and their implications on the generation of food waste (Southerton and Yates, 2014).

2.2 Social practice theory

Practice theory is regarded as an important research approach in sociology (Schatzki, 1996; Reckwitz, 2002) and is widely used to analyse the environment and sustainable development problems (E. A. Shove, 2003; E. Shove, 2010; Spurling et al., 2013; McMeekin, 2014; Warde, 2016a). Although the term "practice" is used across disciplines, most approaches share a core premise that the practice is the smallest unit of analysis and the social world is composed of practices, while individuals carry and perform practices (Cetina et al., 2005). The practices themselves become the focus of analysis, shifting attention away from reflective and rational market choice and individual decision making (E. Shove, 2010; Warde, 2016b; Ishangulyyev et al., 2019).

Practises are defined as “a temporally unfolding and spatially dispersed nexus of doings and sayings” by Schatzki (1996, p. 86), which suggests that practices can be seen as coordinated ‘entities’ that are reproduced and changed through concrete ‘performances’ (Ishangulyyev et al., 2019). Following Giddens' (1984) structuration theory, practices included both structure (as an entity of related elements) and agency (concrete enactment and performance). Spurling et al. (2013) promote the idea that individual behaviours are performances of social practices. The effects of intervening in behaviour are limited because behaviour is the observable expression of social phenomenon (socially shared tastes and meanings, knowledge and skills, materials and infrastructure), not the expression of an individual's values and attitudes (Spurling et al., 2013). According to this perspective, potential for changing behaviour patterns does not depend on persuading or educating individuals to make different decisions or take different actions but on transforming the nature of the practices.

Practices are viewed as constituted from some combination of recognizable and identifiable elements (Ishangulyyev et al., 2019). The combination of elements that is taken into account does vary in a different framework, while some frameworks are quite complex and hard to operationalise. To achieve the aim of this study, the analytical framework of E. Shove et al. (2012) was applied. According to this framework, social practices are made of three elements: material, competence and meaning.

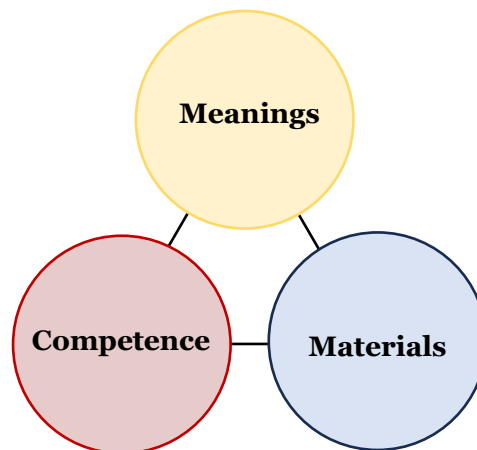


Fig.2.2 The elements of practice (Shove et al., 2012: 23).

E. Shove et al (2012) believe that the successful implementation of social practice depends on these three elements—*Materials*, *Competence* and *Meanings*. In this model, *Materials* refer to objects, tools and infrastructures needed to perform a certain practice. *Competence* is the knowledge that people need to acquire and the skills they need to embody in order to conduct the behaviour. And *Meanings* refer to cultural conventions, expectations and socially shared meanings that people attach to the practice. For each case, *Materials*, *Competence* and *Meanings* can refer to different specific things. The purpose of the model is to analyse the existing three elements and their interrelationships. From there, the components are modified to reform a new framework of practice to achieve reformed practice.

Given the remaining questions regarding food waste, this thesis adopts a social practice approach. By drawing on the analytical framework of social practice theory, this study attempts to identify and categorise the various influencing factors in this practice of food waste. The role that different elements play in influencing food waste is explored by examining people's everyday food practices and the reasons why they make the choices they do. This will lead to a better understanding of how the social environment and everyday routines affect people's food practices. These three elements will be given richer and more practical connotation when applying social practice theory to the explanation and analysis of food waste problems.

2.2.1 Materials

Material refers to objects, tools and infrastructures. In the process of food being wasted or reducing food waste, objects such as food, cookware, packages, refrigerator and trash can are required. The packaging method, packaging size and fresh-keeping technology of food sold in supermarkets are all within the material category. Think about the entire process from food purchase to consumption. The consumer purchases food from a store or other sources, and the food may have been prepared or portioned into various-sized packages. Some of the food may be cooked and some may be preserved once it is brought home. Refrigerators, cookware, and other kitchen appliances are therefore necessary. People need to recycle their leftovers after they consume so the bins for organic waste recycling are also needed.

In addition to the locations where food is prepared or consumed at home, infrastructures also include dining places like canteens and restaurants. Facilities and standards for food waste sorting and recycling in these places are also included.

2.2.2 Competence

Competence refers to knowledge and embodied skills required to realise a practice. People need the ability to store food in order to prevent food waste. They must understand how to properly dispose of food waste as well as how to store food to increase its freshness. People

require practical knowledge of techniques for preserving food, including cooking, soaking in water, drying, and cold storage or freezing. They also require an understanding of things like waste sorting principles.

Reduced food waste is also a result of improved food consumption cognition and planning skills. This is because overestimation of household food consumption may lead to purchasing too much food to the point of excessive waste. A proper food consumption cognition and good plan may result in fewer impulsive food purchases and less waste.

2.2.3 Meaning

Meanings refer to cultural conventions, expectations and socially shared meanings (McMeekin, 2014). It has become a social consensus that reducing food waste, not over-consuming, properly sorting and recycling garbage and so on are important ways of environmental protection and sustainable development. In this study, it's assumed that people are aware that reducing food waste is a right and necessary thing to do. But it's still valuable to find out how people gain this common awareness for it could inform further efforts to raise public awareness and enrich the means of communication.

3. Methodology

3.1 Method choosing

Previous research on consumer food waste behaviour has primarily employed three methods: food waste auditing, surveys, and diaries (Keegan & Breadsell, 2021). The survey can take on different forms such as online questionnaire, face to face interview, or telephone survey and so on. Data acquired through surveys and diaries are usually self-reported, whereas data collected through food waste auditing is quantitative and subjective.

Conducting food waste auditing can provide accurate data on the types and volumes of food waste. Detailed behaviour patterns of consumers can be drawn based on these data. However, it is also a timely and costly process for it requires a large number of participants and unified measurement standards and tools. This method is usually used in studies with long research cycles or by official organisations, for example, the survey mentioned in the introduction selection conducted by the Ministry of Agriculture, Nature and Food Quality and Het Voedingscentrum. But for this research, due to the limitation of time and budget, there are no conditions for the implementation of a food waste audit. Besides, the data of a specific amount of food waste is not necessarily useful to understand when, where and why food waste occurs. It is therefore not an option for this study.

Diary and interview are widely used in food waste research. But the data collected through these ways are self-reported which is thought to have a degree of bias. Participants tend to report their behaviour or attitude more positively because of social desirability (Jörissen et al., 2015; Giordano et al., 2018). Diary is considered to have fewer discrepancies in self-reporting because it can reduce the likelihood of retrospection, achieved by minimizing the amount of time elapsed between an experience and the account of this experience (Bolger et al., 2003). However, in the actual conduction, participants still tend to record less waste than they actually did. Since the main focus of this study was not the actual amount of food wasted, a certain amount of bias is acceptable. The focus of data collection in this study is on observational records of consumers' daily food waste behaviour, such as types of food, motivations for waste, etc. Specific details will be developed below. Another shortage of the diary method is the rate of abandonment and deception (Langley et al., 2010). Diary requires a certain amount of effort, so that a participant may decide to recall at a later stage of the survey, rather than filling in the diary every day (or after every meal), partly "inventing" the type and amount of waste. To avoid this, and given the overall time constraints of the study, it is decided that the diary survey's duration only takes 7 days.

Although the type of food waste can be recorded by diary, other information, such as the motivation, explanation of certain action, difficulties they met, suggestions or demands, is also needed to answer research questions. This information is narrative and personal, semi-structured interviewed are deemed most suited method to unveil how behaviour fits in a persons' daily routine and lifestyle. The data of diary can be the basis for an in-depth

interview to formulate interview questions and help interviewees to recall. Semi-structured interview will be conducted in order to answer the research questions while broadening the scope of understanding investigated practice. The interview questions will be developed based on the findings of the diary in order to prevent making assumptions and expectations about participant behaviours that lead to questions that do not fit the real circumstance.

The photo elicitation method will also be used. Participants will be asked to take photos of their storage conditions, refrigerators, and so on. These pictures can be used as a supplement to diary. The advantage of using photo elicitation rather than word - only interviewing to conduct surveys is that the photographs entice the respondent, trigger memories, and may evoke more levels of emotional response from the participants, allowing for more concrete information to be gathered.

In summary, a mixed method including diary and interview, will be used in this study to collect data, in order to get insight into consumers' attitudes and behaviour about food waste reduction.

3.2 Participant selection

The study's study population is students from Wageningen University.

In light of the length and scope of the study, 15 participants were initially planned to be gathered. Due to personal time constraints of the interviewees, the study was conducted with 13 participants. According to the study on sample size for qualitative studies of Guest et al. in 2006, information or themes saturation occurred within the first twelve interviews. The sample size of this study is 13, which is greater than 12, and it can be considered that adequate data were collected.

To get a varied and representative sample of Wageningen University students for comprehensive insights, the sample strategy for this study will combine snowball sampling through referrals from friends with convenience sampling through Internet advertisements.

This study started with a call for participation among friends and connections to join the study. It could have a snowball effect by broadening the participant pool and potentially introducing students with unique perspectives. This approach aimed for the involvement of a larger group of students, improving the generalizability of the findings. Participants came from different food cultures and different ways of living so that they may have different food consumption and waste habits. And based on previous study, home size influenced a lot on the amount of food waste. So that participants who lives with different home size (self-living, sharing with other people, living with parents, etc.) are intentionally gathered. All participants in the study received informed permission, maintained their privacy, and remained anonymous due to ethical reasons.

3.3 Diary

A short timeslot will reduce the time and effort people spend on the survey in order to stimulate participants' motivation to get more accurate data (Giordano et al., 2018). Taking the time limits of the study into account, the diary conducted for one week long and took no longer than 30 minutes per day.

A recording table with detailed instructions was made by Excel. Participants received the file and were asked to fill in the table. They were asked to record their food waste after every meal or at least every day to minimise the possibility of forgetting and data inventing. Before the survey started, all participants were shared the definition of waste in this study, which has been illustrated in 2.1 Food waste, to avoid inconsistencies in recording caused by participants' different definitions of food waste. Participants also reported their mode of living, e.g., living on their own, sharing with others, living with parents, etc. Participants were also asked to take photos of their storage conditions, such as refrigerators and so on during this time. These pictures can be used as a data supplement to the diary.

A small pilot test which contents two people for 3 days were held to make sure that the recording table was comprehensive and easy to understand and complete.

When designing the table, the following questions were considered necessary and appropriate to ask through the diary in order to fulfil the purpose of answering the research questions and preparing for further interviews:

- What food do you buy?
- What food do you waste?
- When did you waste it/them?
- How did you store the food? (In order to know whether participants have skills or knowledge.)
- Why did you throw the food?

Where food is purchased from (size and manner of packaging) and how it is stored (material conditions) can be categorised as material elements of the social practice theory. The quantity and type of food purchased (planned or not) and the way it is stored can be categorised as the competence element of the social practice theory.

The food waste diary form used in this study is attached in Appendix 1.

3.4 Interview

The purpose of doing interviews is to get personal and narrative information that is difficult to get from a diary. In particular, it was aimed at consumers' motivations for food waste behaviour and the efforts and inconveniences they had experienced in reducing food waste. Therefore, the interview questions were formulated based in part on the results of the diary. The interview was semi-structured so that it was feasible to collect the desired responses while also learning more about the participants' feelings, perceptions and suggestions.

The interview questionnaire used in this study is attached as Appendix 8.2.

3.5 Diagram of the data collection

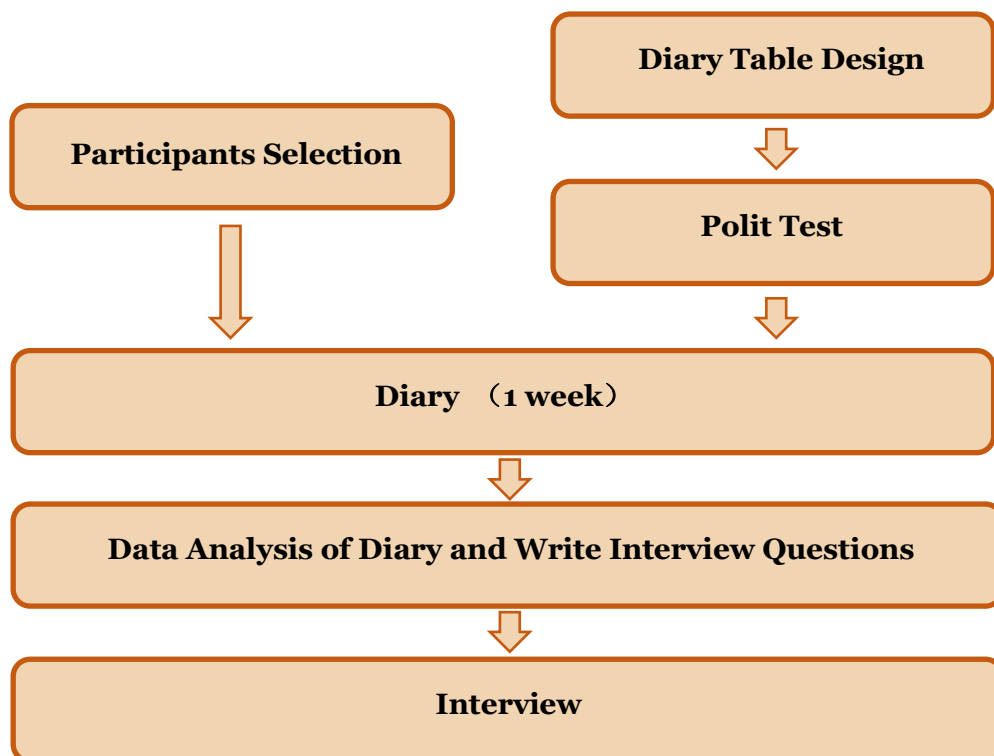


Fig.3.5 Diagram of the data collection

4. Result

Considering the sample size is small and the data processing effort is not heavy, the coding work of the transcripts of the interviews was done manually in Excel. Tables and images are generated through Microsoft Office.

Wageningen University has students from all countries. This study sees this as an opportunity to investigate whether different household size, nationalities and cultural backgrounds have an impact on the eating and consumption habits of the interviewees. The percentage of nationality of the final interviewees is as follows.

Living condition	Household size	Number
Self-contained	1	7
Living with shared facilities	1	2
Living with others	2	3
Living with family	3	1

Table.4-1 Household size of interviewees

Nationality	Number	Percentage
Dutch	4	30.77%
Chinese	4	30.77%
Korean	2	15.38%
Indian	2	15.38%
American	1	7.69%

Table.4-2 Nationalities of interviewees

4.1 The reasons of food waste

Food consumption and waste is a complex social practice. In other words, it is a practice that includes commuting, consumption, cooking, eating, taking out the garbage and other social practices. When consumers' food-related practice are deconstructed (see Figure 4.1.1), it contents planning, shopping, storing, cooking, eating and managing leftovers, which all play a decisive role in food provisioning and food waste generation (Schanes et al., 2018). At every stage, food may be assessed for its edibility and therefore either wasted or redistributed (which is being stored, cooked or eaten) so that food waste can occur at every stage. This is also evidenced by the participants' recordings in diaries and their descriptions in the interviews.

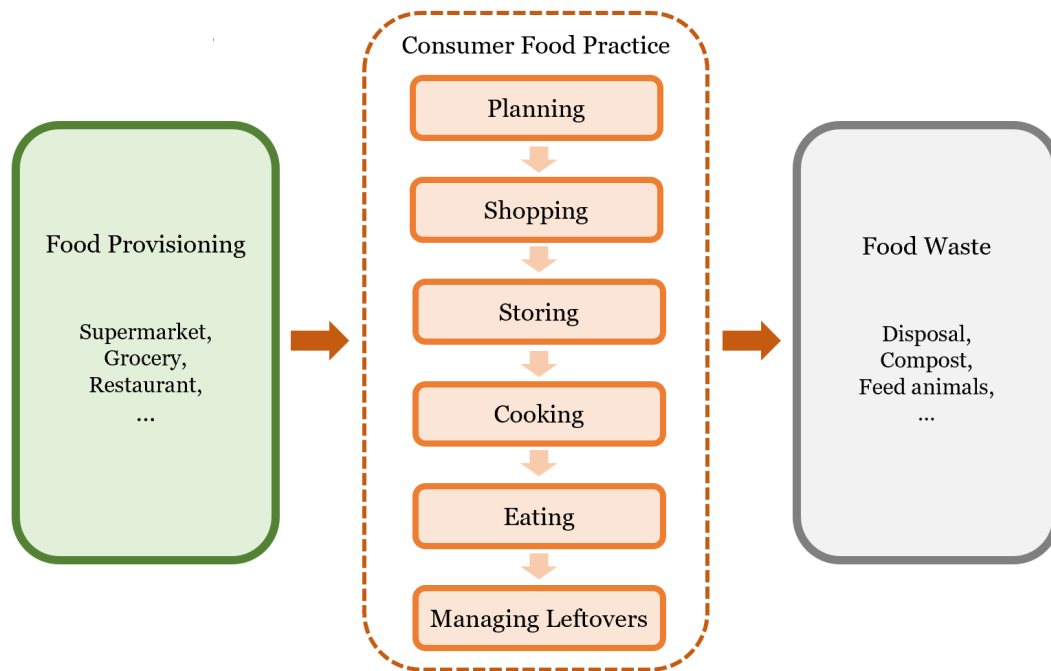


Fig.4.1.1 Food-related practices and routines

According to the food waste diary, the behaviour of food being thrown away usually happened in the morning or at night. Some participants indicated that they usually check the fridge or their food box when they prepare breakfast so that they can learn about the food available at home and plan their food shopping for the day. This kind of waste can be considered to occur at the planning stage. Some waste usually happens around cooking and eating time. People sometimes throw away food that they have made too much of, that they haven't finished on their plate, or that they don't think is suitable to leave for another meal.

- “(I throw away food in the morning) because I usually check the fridge when I make breakfast so that I can decide whether I will go for shopping on that day and what needs to buy.”
- “My food waste is mostly from making a bit too much to eat, but then there's a small bite left over and not enough to serve as the next meal.”
- “I usually find that some vegetables are wilted or just not so fresh when I'm cooking. Then I found that I don't really want to eat them anymore. And for me it's just a waste of storage space to keep them, so I just throw them away.”

Participants were also asked to identify their underlying causes of food waste after evaluating their food waste diary as well as their usual habits. And the reasons they gave can be summarised into three: Overestimation of food amount when cooking or eating, over purchase, and Limitations on storage conditions.

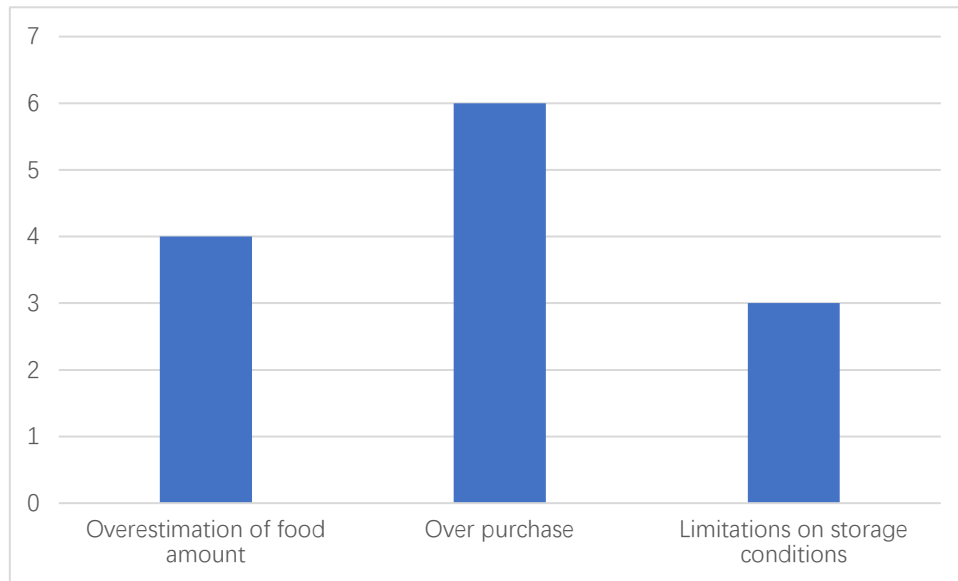


Fig.4.1.2 The main causes of food waste

From the data, unlike the stage at which food is actually thrown away, which is shown by diary, the majority of participants believed that the main causes of food waste occurred at more forward stages, like planning, shopping and storing stages. However, most of the participants also indicated that their reasons for food waste were not singular. In other words, a single food waste could be influenced by a combination of these reasons mentioned above.

- “Although I do buy too much food all the time, especially vegetables and fruit. But I think if I can have a bigger fridge, the food I waste because I forget to eat or not being putted in fridge will be definitely less.”
- “I usually go to the supermarket on my way home from class. By this time, I'm usually very hungry and feel like that I can eat a lot for dinner. So almost everything in supermarket looks tasty for me and I just bought them.”

According to social practice theory, the drivers of food waste can be categorised as: materials, capabilities, and meaning. In order to discuss in a more structured way how these factors play a role in consumers' food practices, the next section will analyse each factor in each stage. Considering that meaning has an impact on the whole process, it will be discussed separately in a subsection.

4.2 Drivers of food waste during food-related practices

4.2.1 Meaning

Meanings refer to cultural conventions, expectations and socially shared meanings. An important element of the meaning dimension in this study is **the awareness of conserving food resources and reducing food waste**, which many studies have

shown to be a social consensus. This point of view was also verified from the interviews. All interviewees agreed that saving food resources or reducing food waste is right and important.

Although the interviewees shared the same understanding of the issue, the sources from which they gained this understanding and the main reasons why they agreed with it were different.

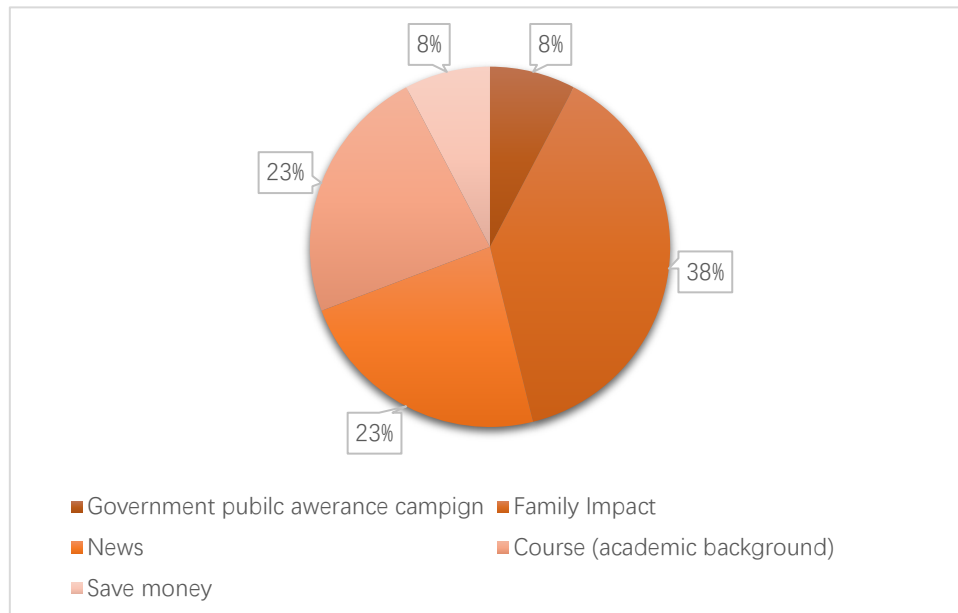


Fig 4.2.1 Where do you get your awareness of reducing food waste?

Figure 4.2.1 shows the source of the interviewees' awareness of the need to reduce food waste. Five people said that the awareness of saving food was instilled by their family members from a young age and was an important rule that was imbibed in their family life.

- “When I was growing up, my dad made us really aware of food waste. So, we talked about it a lot in my household when I was younger. Like my dad really emphasized no food waste as much as possible.”
- “Because the environment I grew up in, my family, my parents always told me that do not waste food since I was a very young kid.”

It is also worth noting that three of four Chinese interviewees in this interview reported that their awareness of "saving food" was acquired from a young age in the family environment. They indicated that saving food is a traditional moral and is widely publicised in China.

Three respondents from the Netherlands indicated that their knowledge of food waste came from their academic background. They had taken courses that covered related knowledge. Three respondents also indicated that they had seen reports or information about food waste in the news or on social media.

One interviewee from China also mentioned that he felt that the "Clear Your Plate" campaign implemented by the Chinese government had helped to raise his awareness of food conservation and that he had learnt how to reduce food waste during that period of time, such as ordering according to the quantity of food when eating in restaurants.

Only one respondent indicated that the reason for being careful about saving food was to save money on living expenses.

- "Because I live on a tight budget and this tight budget also apply for my grocery shopping. So, in order to reduce my living cost, I, but only by the things that I want to eat and the amount that I would eat."

It is noteworthy, however, that only two respondents indicated that they had a strong motivation to save food. One was the one who believed that saving money was the most important reason to save food, and the other had a relevant academic background.

Another consensus among people found during the research was '**good provider identity**'. In past qualitative (Evans, 2012; Graham-Rowe et al., 2014) and quantitative (Visschers et al., 2016) studies, "good provider status" has been defined as the desire to be a "good" parent or a "good" mate, which appears to be a significant contributor to food waste. But in this case, a better definition of "good provider identity" might be someone who can take **good** care of themselves. Many students left home and come to Wageningen University. The unfamiliar environment and independent living made them feel that they need to take responsibility for their own life and health. Fresh and plentiful food is often perceived to provide better nutrition and quality of life. They sometimes see providing themselves with abundant food as a reflection of their ability and actions to take care of themselves. So, they sometimes tend to buy a lot of food which is considered healthy. But a large number of these "healthy" foods include perishable categories such as vegetables and fruits that are at risk of being wasted.

This consensus will run through the whole activity of food consumption. For example, during the planning and shopping stages, people will tend to overestimate and purchase. When there is enough time, people will cook more; when they are too busy to cook, more food will be wasted at the storing stage.

- "So, for example, I would now want to eat healthier. Like when I want to eat some snacks, I would buy small tomatoes or some fruits, rather than something like biscuits and chips or something like that."
- "I think I have to take care of myself when I'm leaving my parents and living on my own. So, I would like to eat better and try to prepare vegetables and meat at every meal, and I eat fruit every day."

4.2.2 Planning

Careful planning of grocery shopping is considered to be an effective tool in preventing over-buying and thus food waste (Parizeau et al., 2015; Secondi et al., 2015). Planning

includes making meal plans in advance, checking inventory before shopping and preparing a shopping list.

Although some people don't realise it, all interviewees have a clear or vague plan of their recipes or shopping lists. The differences were related to: the completeness of the plan, the medium of the plan, the standard of the plan, and the frequency of plan shopping.

Material

There are not many material factors that play a role in the act of planning. One of the interesting points is what **medium** do young people use to make their plans. In supermarkets, it is common to see people shopping while checking the notes in their hands. However, in this interview, the interviewees usually use their mobile phone memos to make plans or just think of a vague plan in their head. For young people, planning via mobile phones is more convenient and portable.

- "I know what we need to buy so you don't have to write it down. But my sister and I are a bit more like, okay, we're gonna make a list on phones so we have it with us."
- "I don't, umm, write little notes like I've seen people do in supermarkets. Although I don't always make a list, but if I need to do it, like I have some important or desired food needed to buy, I will just write a memo on my phone."

Competence and Knowledge

From observations of participants' diaries and subsequent interviews, it became clear that accurate and detailed food planning required considerable competence and knowledge to achieve.

To create a more accurate plan, the capacity to make a reasonable **prediction** of what kind of food and how much food are needed for some days. Many participants demonstrated that they were not good at this. And unreasonable predictions often lead to unreasonable plans, and that's one of the things that leads to overbuying.

The first thing of a food plan is about the frequency of food purchases. Although the act of buying itself is strongly associated with the consumer's daily schedule and location to the supply, the number of purchases is generally planned. The frequency of food purchases is related to the type and quantity of food that are needed for the planned time period and how long this food can be stored. Most people said they plan their meals for a period of time before deciding whether to go food shopping. Figure 4.2.2 shows the frequency of food consumption by participants during the week of the survey. It can be seen that there is a great deal of variation, with some buying food every day and the least buying only twice a week. The food planning strategies used by the participants were also very different.

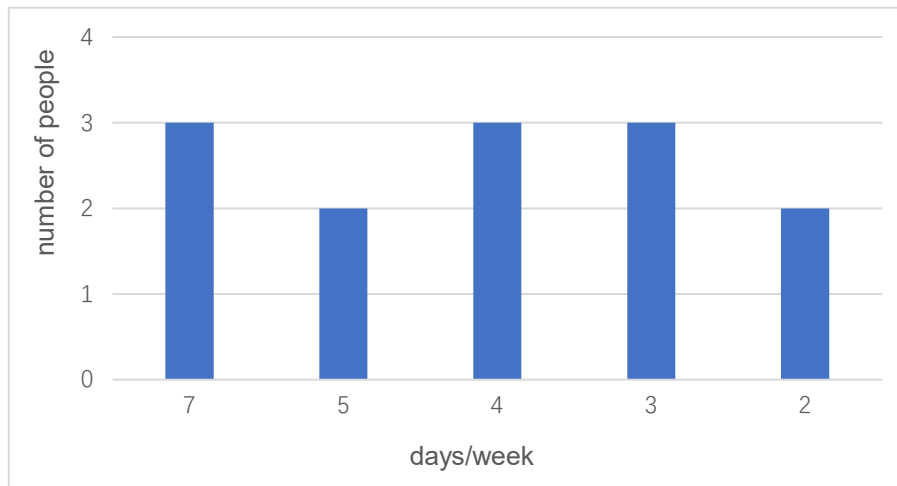


Fig 4.2.2 Food purchase times over a week

Some choose to plan their meals for the following week:

- “Normally I decide what I eat next week and go to open market every Saturday to buy vegetables and fruits. And on the other days is depends on my own situation if I want to buy some snacks, I will go to supermarket for one or two times.”

Some make estimates for meals for the same day or the next day:

- “I'm just too lazy to predict what I'm gonna eat the whole week. So, I picked like what I want to eat that day or maybe the day after, or I do plan further, but I forget some things so I usually have to go more times a week to have all I need.

However, it is interesting to find that regardless of whether participants chose a longer-term or a shorter-term prediction strategy, there were those who felt that it might be better to change their strategy.

- “Normally I buy one week's food for meals on Saturday, so in this way maybe I will over calculate the food I eat, so it's not very precise. So maybe if I cut this into maybe twice a week and calculate the halfway the food I need.”
- “I think I should go to the supermarket less often. Every time I go to the supermarket, I can't help myself and I just buy more and more, but there's actually a lot of food in the house. Maybe two or three times a week is enough.”

The emergence of this idea could indicate that participants were not satisfied with the current state of their food plan. And before that they were not able to make reasonable predictions about the food, they needed based on the current state of their food consumption. This lack of ability also makes them believed that they were purchasing too much food.

In addition to this, when doing a food plan, it is important to have **information about the food stored** in your home. This knowledge helps to avoid purchasing unnecessary

items. Respondents reported that they check the fridge or shelves where food is kept when planning, or before going out to shop, which is also proved that it's a more generally accepted knowledge.

For people who are living with others, the ability or awareness to **communicate with family members or peers** about food was also one of the important competencies. In some families there will be a clear person who is primarily responsible for food related work. People may be responsible for food planning, purchasing, cooking, etc., or one person may be responsible for all of these activities in a household. In such families, it is less likely that family members other than this person will buy excessive or duplicate food. Whereas, in the household without such a division of labour, or when living in a shared house, the likelihood of duplicate purchases is increased. Communication between members may help to reduce food waste by avoiding such situations.

- "It's a bit dependent on whether my sister and I, whether we are busy, like an exam week. She's now studying for exams so I do some more groceries so she doesn't have to do so. We switch a lot. It changes weekly, sometimes daily."

4.2.3 Shopping

Participants' main food shopping destinations were supermarkets (Jumbo, Hoogvliet, Albert Heijn and Lidl), grocery shops, open-air markets, and online shopping (through too good to go).

From the interviewees' own perceptions, nearly half of them agreed that the main reason for their food waste was because they had bought more food than they needed. The consumption stage is the main food income stage. When food is purchased from the food supply, such as supermarkets, markets, groceries or restaurants, the destination of this food is basically wasted, except for what is eaten. So, controlling the type and quantity of food purchased during the shopping phase is very important to control the amount of food waste.

Material

The practice of food shopping is highly related to **daily schedule**. Interviewees indicated that although many food purchases were planned in advance, unplanned food purchases could easily occur if they would pass by the food suppliers in their daily activities. The food purchases beyond plan may result in food that was originally planned not being eaten.

- "I usually go to Jumbo on my way back home after class. Because I'm often getting hungry then so I just get a croissant or something to fill myself up."

The **location** is another factor which can influence the shopping frequency and the choose of food suppliers. According to the diaries, participants usually had their own preferred shopping locations. Students claimed that when they have daily shopping to do, they usually go to locations nearby where they live. Shops that are set further distant from others

will receive fewer visits. Food is offered by suppliers in a variety of formats, including weighed, packaged, and handled. Additionally, there are differences in the packaging specifications. The food's shelf life and rate of utilisation will also be impacted by all of these variables. But the interesting point is that this positional restriction doesn't seem to work for the Dutch students. Cycling is the main form of commuting for students living in Wageningen. Participants from the Netherlands said they wouldn't let the distance stop them from visiting a specific store in this tiny town. Still, the majority of international students stated that distance was definitely a significant consideration in determining where they would go to buy food.

Price is undoubtedly an important factor in the buying process. Price usually influences people's food consumption behaviour in three ways. The first is supermarket discounts, such as buy one get one free, second item half price, or three for five euros. These promotional offers can encourage consumers to buy more than they actually need, leading to food waste. These promotional offers can encourage consumers to buy more than they actually need, leading to food waste. The second is in the choice of packaging. Foods in large packages are generally much more cost-effective compared to those in small packages. Several people also mentioned that their choice of purchase place is also influenced by pricing. If they heard about a promotion from an advertisement or other sources, they would visit the supermarket. While there are sometimes people who don't buy more quantities to take part in a sale because of practical needs, most people will still go for the cheaper price if possible. Finally, there is the effect of price on the choice of where to buy. Consumers compare suppliers of the same type, such as supermarket chains. Some people, for example, say that they go to Albert Heijn less frequently because it is generally more expensive than other supermarkets.

- "Like for fruits, I usually only buy what's on discount. (No promotions) Not possible. I 'll get whatever discount I can get."
- "I don't really have one shop I go to. I look at like what is discounted at one shop. Yeah, if something is cheaper somewhere then I'll try to go there."

Different food suppliers will sell food in different **forms of packaging**. Food is offered in a variety of types and packaging at major retail chains. There are non-prepackaged and prepackaged whole vegetables, fruits, meats, etc. There are also processed foods, such as cut lettuce, peeled potatoes, seasoned meats, cooked pasta and so on. In small grocery shops, or open-air markets, food is usually non-prepackaged. The impact of food packaging on food waste is complex and sometimes contradictory. During the interviews, many respondents felt that they were able to make their own decisions about the amount of unpackaged food they purchased. And unpackaged food produces less plastic waste. So, some of them think more unpackaged whole food sold in supermarket might make them produce less waste. However, some foods do need the protection of packaging, given the losses incurred during transport and when consumers pick them up in supermarkets. In the absence of accurate quantitative survey results, it is difficult to discuss what form of packaging would minimise the generation of food waste. But there is no doubt that the shelf

life of processed foods, especially cut fruits and vegetables, is greatly reduced compared to whole foods. Some respondents also expressed their concerns about the food safety of pre-processed food:

- “I think that kind of vegetables can’t stay long. And because they are cleaned and put into package, so they are quite easy to go bad. And sometimes you can see there is one or two leaves are not fresh. Then I'd be worried that whether the whole bag is not good.”

And packaged food usually is in different **packaging sizes** to suit different needs. Larger packages of food are generally more cost-effective than smaller ones. Considering that this study was conducted with students, most of the households are smaller and have limited storage space, so large packages or pre-processed foods pose a greater risk of food waste. However, due to price considerations, consumers are still likely to purchase these large packages or pre-processed foods. Yet, some people voice their disapproval of big products that appear to be economical.

- “I don’t buy the big one. I think if I buy the bigger one, I will certainly waste some of it. If take the waste part into account, it’s not economical anymore.”

Some people are dissatisfied with the packaging specifications now offered by supermarkets. Portions of packaged food are often too much for people who live alone. But for people living with others, the specification of food available in supermarkets may not always meet their needs either.

- “We are with three people and you can mostly buy things, for example with vegetarian meats like for two people or for four. Then we need to buy like three packages to have like for three for two meals. Or we buy two packages. So, everyone has one piece and an extra bit. Or you have to store it.”

Competence and Knowledge

An interesting competence in the stage of shopping is the **execution of the plan**. Regardless of the completeness or clarity of the plan, people basically have a plan before food shopping. However, in the survey it was found that people have different ideas about execution of the plan. Some people will only buy what is on their shopping list. Whereas some people think that the list is just a reminder of what they have to buy and they will stay in the supermarket for some time and buy some food items that are not on the list. Some of the reasons for buying extra food are: sudden appetite, good price or promotion, freshness or good selling visual, etc. There are also those who are not prepared to spend exactly according to the list when they make their plans. They say they go to the supermarket for inspiration when they don't know what they are going to eat for the next while. Such times can be considered as making food purchases without a plan and can easily turn out to be decisions made without integrating the amount of food eaten, stock and storage capacity, etc.

- “I usually write down what I have to buy on my phone, and the rest is more random. I go to the supermarket to see what looks good.”
- “Sometimes I bought some food just because they looked so fresh or pretty. Especially for the grapes and mushrooms. You know they look really pretty if they are fresh. I think it’s a pity if I miss them. Although I may not eat them in time.”

4.2.4 Storing

Storage is in-between buying and cooking and eating food. During this process, food can therefore be re-examined, re-processed and re-assessed for edibility. This stage is highly relevant to material factors and also requires a great deal of skill and knowledge to assist.

In order to be different from the management of leftovers, only the storage of ingredients is discussed in this section.

Material

The **refrigerator** is probably the most important food storage tool for modern life. Putting food in the refrigerator's fridge or freezer can greatly extend the edible time of food. A survey of the storage conditions of the respondents found that all of them had at least one refrigerator in their residence. Two of the respondents had large refrigerators in their place. Four shared the large fridge with others, each of whom would be allocated a demarcated area. The remaining seven had their own small fridge. Many people report that they rely heavily on their refrigerator for food storage.

- “I basically put all the food I bought in the fridge. So, my fridge seems to be pretty full all the time. But fridge is amazing.”

The capacity of the refrigerator is the more important limitation for food storage. If the capacity of the refrigerator is large enough, even if too much food is bought at the purchasing stage, the refrigerator will be able to provide some buffer time for the food to be consumed as much as possible. However, when the capacity of the refrigerator is insufficient, it limits the amount of food that can be purchased or prevents some food that needs to be kept in the refrigerator from being properly stored. Whilst participants reported that they generally checked their food stocks when making shopping plans, such restrictions and feedback were not always effective. The reasons for unplanned purchases mentioned in the previous chapter may cause people to buy more food than they can store at home and make food waste more likely.

- “I think my refrigerator is a little bit small for me, especially the freezer. It is a small one so the freezer is short. Sometimes it’s even hard to put a bottle of ice cream inside if there’s a layer of ice on the top of it.”

If the food itself has a longer **shelf life**, it is less likely that much of it will go bad during

preservation. The food manufacturer and the packaging industry have a major impact in this. In interviews with international students there were some who thought that vegetables in the Netherlands were more likely to go bad than vegetables in their home countries. More precise experiments may be needed to verify this point. However, for perishable food such as vegetables and fruits, if their shelf life can be extended, it will definitely be conducive to the reduction of food waste. This requires the efforts of stakeholders in the production, packaging and transport of food.

- "I don't know why but I think some vegetables and fruits here are easier to go bad, like coriander and plums. I think they go bad faster than the coriander I bought in China."

Competence and Knowledge

Proper and correct **storage methods** can extend the freshness of food. During the interviews, it was found that despite recording some food wastage due to improper storage in their diaries, the interviewees hardly felt that they lacked the knowledge and skills to do so. In other words, most of them don't feel that knowledge about how to store food is important and necessary. For food storage methods, some of them are fans of refrigerators. They relied heavily on the refrigerator for their storage. They choose to keep almost all of their fresh ingredients in the fridge. Some say they follow supermarket displays to storage the food at home. Only one respondent indicated that she had learnt about food storage methods in an event on food and would do along the principles she learnt. But she said the event was something she attended by accident.

- "I do the same as supermarket. If it's in fridge, I'll put into my fridge. If it just put on the shelf, I won't put it in my fridge."
- "Well, I once got a sticker from an organization about combating food ways. And on the sticker, there are some vegetables that they told me not to put in a fridge. So, I put the sticker on my fridge and just like watch it as I do it."

It was also revealed in the interviews that some of the participants would know some storage tips. They knew these tips generally through social media rather than learning them intentionally. Of course, there is also some knowledge learnt from elders in the family.

- "I only have a storage tip for avocados. Like when I've cut an avocado, I usually only use the half of it. For the other half, the peel is still on top, so the cut side is down and I put it in water."
- "If I don't finish a tofu, I'll put the remained part into the original box and put water over it. If I don't finish the other part in maybe one or two days, I'll change the water so that it can be kept longer. I learned it from my mom."

People have different methods of **food storage management**. Systematic storage strategy is considered as a way to reduce food waste generation (Schanes et al., 2018). It

refers to the systematic coding of food according to the date of purchase, expiry date, or according to the frequency of use combined with periodic reordering. In the diaries and interviews, it was found that many people experienced waste because they forgot certain foods. The reason could be that they did not regularly check and clean up the food in their homes. Space inside the refrigerator is limited, and sometimes food is stacked in such a way that it obstructs vision and creates blind spots. This, coupled with a lack of knowledge about the best place to put certain types of food, often hinders systematic storage. And a systematic approach to managing food storage improves visibility and prevents forgetting food hidden in the back of the fridge or cupboard.

Edibility assessment is also an important competence and knowledge factor in the storage phase, which is also a part of food storage management. People often use a variety of strategies to assess the palatability of food, most commonly through using one's senses like smelling or tasting, and checking labelled 'best before' dates. In the survey, it was found that most people would use a combination of these two methods. Or they would first check the best before date of the food, and if they found that it was past its expiry date, they would judge whether the food was still edible by smelling or tasting it. It also means that most people are aware that dates on products are sometimes confusing and can be interpreted as either "expiry dates" or "best before" dates.

- "When it's past the expiry date I will always still smell it, taste a little, see if it's still good and try to eat it. Yeah, or like if it's a like apple has a brown spot and I will still just cut it off and try to eat rest and not waste the whole thing,"

4.2.5 Cooking

According to the participants' reports, their usual diet is mainly cooked by themselves. The frequency of eating at restaurants or takeaways was relatively low. Cooking is therefore important in the food activities of this group.

Food waste is impacted in cooking process in a number of significant ways. The most often reported reason is that they usually prepare too much food, which ends up uneaten and thrown away. The lack of adequate culinary techniques they could use was another factor.

Material

When being asked why occasionally makes too much food, many people believed that the **portion sizes of food** sold in supermarket have an impact on the portion sizes for cooking. Interviewees reported that they sometimes cooked food based on the amount of food in a packet from the supermarket.

For some foods sold in certain amount, such as packaged vegetables, people often use a whole packet or half a packet. People are less inclined to accurately estimate the amount needed for each meal and then store the remainder again. There are several reasons for this: Firstly, limited storage space. As mentioned in the storage section, most of the

interviewees had limited space and facilities for storing food. If the small portion of food left over after each cooking session was properly stored for next time, it would put a lot of pressure on the storage capacity of the home. And these leftover trimmings can easily be forgotten. Another reason is that these leftover foods can easily become not fresh, such as chopped lettuce after opening, or a half-cut onion. Another reason is that these leftover foods can easily become not fresh, such as chopped lettuce after opening it, or a half-cut onion. Some people say they are not willing to eat food that doesn't look fresh or health. In order to avoid food becoming not fresh and thus wasted during the storage stage, they would cook all of these foods.

- “I bought it (chopped lettuce) because it’s convenient to making salads. Actually, a whole package is too much for me at a time, although it’s already the smallest one. But I have to use the whole package because you know it’ll get wet after you’ve opened it.”

It is also important to note that cooking is one means of extending the edible life of some foods. Sometimes **excessive food storage** forces people to cook more dishes. However, they often do not finish the dishes in a short period of time. The end result is repeated reheating or too long storage in the refrigerator discourages people from finishing them.

- “The eggplant was going bad, so I have to cook it. But I have other dishes to eat those days so I have a lot of leftover need to eat. After some time, it looked not suitable or tasty to eat anymore.”

And another material factor is the **size of household**. Different family sizes make a difference in the amount of cooking per meal. Ten people in this interview cook for one person only, and nine of them said that the amount of cooking was not easy to control due to their small household size. It is difficult to make small portions of many dishes, such as stews and soups. And making large quantities often means a greater likelihood of waste in the case of living alone. And for those living with others, while cooking large portion sizes was not a problem, they also faced challenges from estimating the amount to cook.

- “You know I live alone. I can’t eat a lot for one meal. But if the amount of food is too small, it’s hard for me to cook. I can’t just make two slices of pork at a time. I have to cook for two or three meals at a time, and then I will forget it or don’t want to eat it in the end.”
- “We sometimes cook a little bit more food because we are afraid the food is not enough. Sometimes neither of us is hungry, sometimes both of us may be hungry.”

Competence and Knowledge

Obviously, there is a need to acquire **culinary skills** during the cooking stage. Some food waste is caused by the lack of culinary skills. The fact that the participants in this study were students, which were from different countries —is very significant to consider when

analysing this component. They are young and have less experience in cooking compared to their parents. Therefore, it is more common for them to be less good at cooking. Also, for students coming from abroad, this lack of competence in cooking may come from unfamiliarity with local ingredients.

Some of the waste is because the meal doesn't taste good enough. Some people say they don't just pour out food they don't like, but put it in the fridge until it's not fresh enough to eat and then throw it away. Thus, relieving themselves of the psychological burden. Trying unfamiliar ingredients can be fun, but it can also be wasteful. Some people say they have bought food that was new to them. While this sometimes led them to find foods they liked, if they didn't like a food, the food they cooked with could be wasted along with it.

- “There was a time I bought a goat cheese. Wow! I took one bite and it was too strong for me. I decided to make cheese pasta to see if heating it would make it less smelly. I put in cheese, mushrooms and pasta and still couldn't eat it. Then chilli, curry, I tried everything and wasted everything.”

The ability to **control portion sizes** during cooking is also important for saving food. This usually works in combination with household size. To people who live alone, it seems that their ability to predict the amount of cooking they feel is less important. For them, it was more common to just cook a few meals' worth or just follow the recommended portions for one person, such as a packet of instant noodles or a piece of beef or plant-based meat. For those who lived with others, they found the prediction of the amount of cooking to be a little more difficult. However, an interview with a participant who lived with her family revealed that the family member responsible for cooking at her house did not find it difficult. From this it might be surmised that more cooking experience might improve cooking skills and include anticipation of the portion sizes to be cooked.

4.2.6 Eating

There have been few studies investigating the role that this behaviour of eating has on food waste. Several studies have shown the unpredictability of human appetite (Evans, 2012; Ganglbauer et al., 2013). However, family members with special dietary habits (e.g., vegetarians) tend to reduce food waste (Principato et al., 2015).

Materials

Unlike eating at home, **the portion size of food served by restaurants** is usually not determined by the consumer. While uneaten portions can be packaged to take home, not all food is conveniently packaged. Some foods, such as ramen, can be very unpalatable when packed. Some foods have little left over and consumers are less inclined to pack them.

Competence and Knowledge

Prediction is present at every stage in food-related activities including eating phase. And

there are two situations that needs to anticipate the skills of food amount prediction. One is when meals are shared. One is when meals are taken to school or travelling.

When a pot or plate of food was made, people would serve what they thought was enough food on their plates. But such predictions are not always accurate. Leftover food in a pot or on a large plate is usually stored. But leftover food on an individual's plate is often thrown away. And for the food being brought to school for lunch, or carried when travelling, not much of them would be left and the remained part would often be thrown away directly.

- "I sometimes predict I will be able to eat more than I actually did. So, I think it's the prediction of how much I eat. When I take something to the university, I usually take two slices of bread with me for a sandwich, but sometimes I take three slices with bread with me because then I think like I have a full day, I will do some exercises between. And then sometimes I forget I have my third slice of bread or it was not necessary. I think the stuff that I put on my bread have been outside fridge for a lot of hours and then I it doesn't feel safe anymore."

4.2.7 Managing leftovers

Reusing leftovers is considered one of the most effective strategies to combat food waste at the household level (Secondi et al., 2015). In practise, there are a lot of obstacles to overcome when it comes to leftover management. Especially in the study's interest groups, many students living alone. People typically prepare multiple meals at once due to a combination of factors including the ease of cooking, the requirements placed on food in supermarkets, and the constraints of storage spaces, which were previously explained. Consequently, there is a great deal of leftover management in their life.

Materials

For the management of leftovers, the physical factors at play are very similar to the storage phase. Refrigerators are vital facilities. As already discussed in the section on storage, the volume of the refrigerator is an important limitation for food storage in the home. For a limited refrigerator volume, sometimes leftovers and original food in the refrigerator compete for space. However, given the concerns about food safety, people may be hesitant at such times. When the refrigerator is very full, especially if the leftovers are small or not tasty, the likelihood of leftovers being dumped rises.

- "When I for myself, I it's harder to cook for one person more people so I, well, I tried to store it in my fridge or in my freezer and that works but more planning is required for eating alone."

When storing leftovers, people usually keep their food in plastic bags or boxes. There are two main reasons for this: one is for food safety, and the other is to prevent the smell of the fridge itself from affecting the taste of the leftovers. There are also many people who will put their leftovers into the freezer to preserve the taste of the food as much as possible.

- "I love to bake. When I bake a cake, I keep two or three slices outside that I will eat in the first three days, and the rest I put per portion in the fridge. And it's still as good when it comes out, as when I put it in, same as cookie dough."

Competence and Knowledge

Similar to the storage phase, the **assessment of edibility** is an important competence factor in the management phase of leftovers. However, the difference is that the evaluation criteria at this stage may give more weight to food safety concerns than at the storage stage. Because there is no "best before" date to refer to, concerns about foodborne illness and the desire to eat fresh food may prompt people to throw away food that has not spoiled.

4.3 Willingness to change

During the interviews, the willingness of the interviewees to further decrease food waste was also evaluated. Prior to this survey, people knew how important it was to reduce food waste, and after documenting and assessing their eating habits, they thought it was possible to do so. Nonetheless, the majority of respondents indicated hesitation or a lack of confidence in acting.

Firstly, most people do not think they waste a lot of food. And this perception makes them think that there is no need to reduce food waste by changing their behaviour. In this survey, almost all of the people who participated in the group discussion said that they did not waste a lot of food, even though the amount of food wasted varied greatly among them.

Day	Participant 1		Participant 2	
	Wasted Food	Reasons	Wasted Food	Reasons
1			a half box of takeout	go bad
2			some rice	it is dry
3			some little cupcakes	too sweet
4				
5	Chili	too spicy for me		
6				
7	one slice of bread with spread	I made it the day before,	some prunus	rotten
			sticky rice ball	not fresh

Table 4.3 A comparison of two participants food waste for a week

In Table 4.3, the food waste sections of the food diaries of the two participants are compared. It can be seen that there is a big difference in the amount of food they waste, but neither of them thought that they cause a lot of waste.

Secondly, people were hesitant and reluctant to reduce food waste by changing their eating or shopping habits. These are behaviours that they have established over time. It appears that meeting their dietary needs and satisfying their healthy food demands are more important than reducing food waste.

- “No, I won’t change. Well, I used to have vegetables every meal and fruits every day. My parents do so and I stick to it for many years. If I will produce more food waste when I stick to this habit, then, there’s nothing I can do about it. I can’t make me eat unsatisfied dishes just for, maybe saving sources or saving environment.”

The third reason was that they believed that changes in objective factors had a more significant effect on reducing food waste than changes in their individual behaviour. When asked about their suggestions and measures to further reduce food waste, a considerable number of them considered that measures by supermarkets or food producers and processors would be more vigorous. They expressed a lack of confidence in the changes that their behaviour could produce. One was scepticism about the effect that such behavioural change could ultimately have. Secondly, they did not think that they could sustain the change in their food-wasting behaviour.

- “Well, I’m not sure about it. I mean, I think the amount I reduce cannot be that much but I have to pay a lot of effort. Like I have to make very detailed plan. It’s not easy for me. So as far as I can see, it’s not cost-effective. And I don’t think I can stick to it, sometimes I don’t even make a plan.”
- “I think what I can do is quite limited. If, like we discussed before, an improvement on packaging can help people make less food waste, then it’s much easier for me to save food. They can reach wider, right? “

4.4 Configuration of food waste reduction practice

This chapter analyses, interprets and summarises the data from the survey in the order of the consumers' food-related practices. Figure 4.4 summarises the elements referred to in this chapter in terms of the framework of social practice theory – material, competence and meaning. The figure shows the elements and relationships that are currently included in the triad of material, competence and meaning current practices in practices related to food consumption and waste among the groups investigated in this study. These three factors are closely linked, influence, and constrain each other. Moreover, many of the elements influence practices at different stages.

For example, a Wageningen University student is living in a student apartment with good provider identity. This psychological factor may motivate the student to make more food

purchases plan or to buy more food than is needed. This excess food is then stored in limited storage space, such as a small refrigerator provided by the rental agency. The small storage space may allow some food to expire or spoil for a number of reasons, such as being forgotten out of sight or not being stored properly. The student finds and assessed the edibility of these foods when cleaning out the refrigerator and he/she chooses to throw the food away out of concern for food safety or disinterest in the food. Psychological factors, irrational planning or irrational shopping, limited storage space or accommodation, knowledge of storing food, and assessment of the edibility of food may be the ultimate cause of food wastage in the process. A change in any of these elements can make a difference in the status quo of food waste.

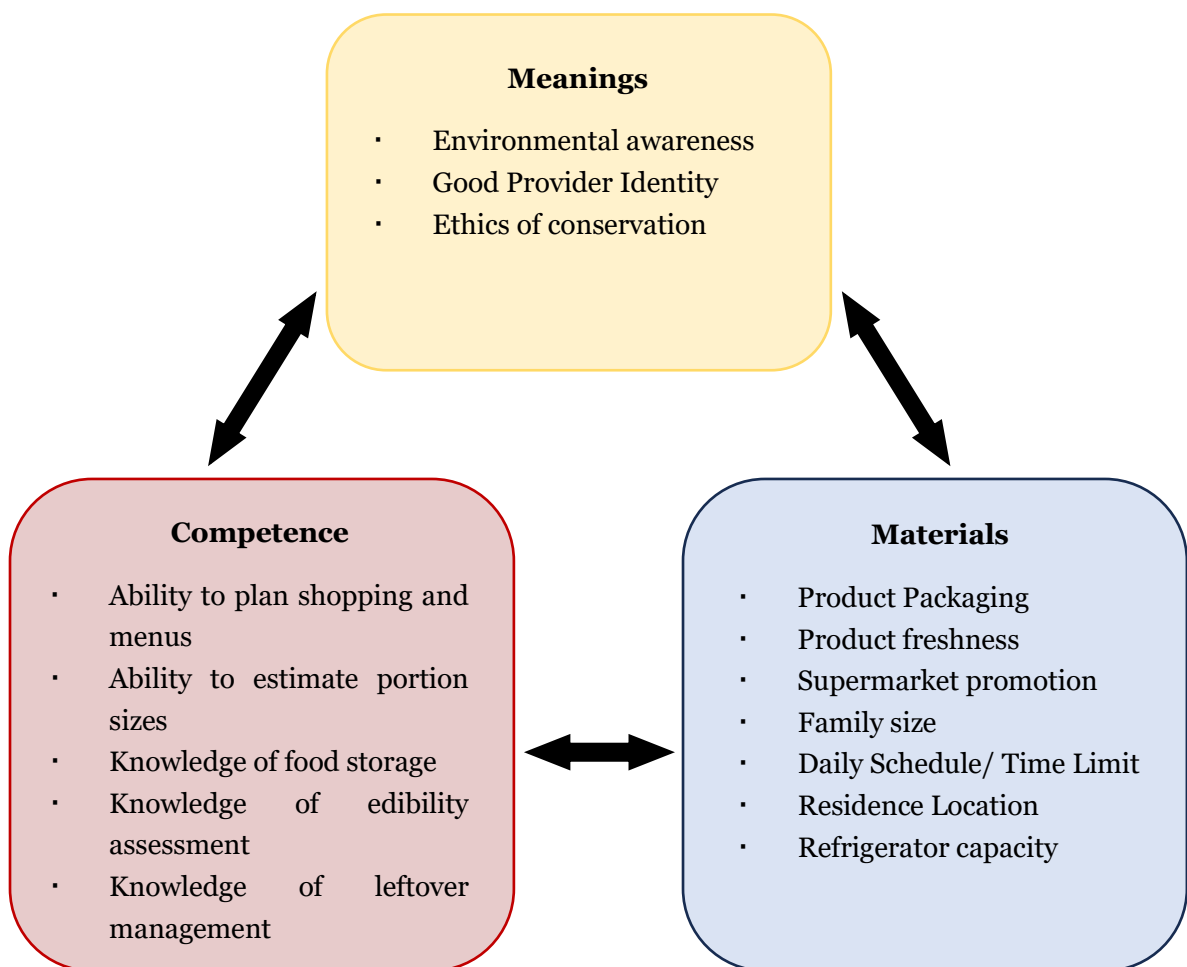


Fig 4.4 Configuration of food waste reduction practice

5. Discussion

In order to achieve the Sustainable Development Goal of halving per capita food waste by 2030 (SDG 12.3), variety of strategies and actions must be implemented. Customers still lack the desire and dedication to actually implement the idea of food conservation in their daily lives, even in spite of the increased focus on food waste in policy and their awareness of the morality and righteousness of reducing food waste. A thorough policy framework is needed to encourage appropriate actions at the individual level and playing the stakeholders' parts in food supply chain. This section will address the reasons for food waste, possible solutions, and challenges encountered.

5.1 Reasons behind food waste and the solutions

From a perspective of real consumer practises, the underlying causes of food waste can be extracted through the interpretation and analysis of data gathered from food waste diaries and interviews. A variety of strategies that could help reduce food waste are developed based on these factors and people's habits. These strategies include policy changes, potential actions for producers and merchants to take, and etc. Table 5.1 provides the reasons behind food waste as well as possible solutions for reducing it.

As mentioned earlier, the Dutch government's current policy efforts to reduce food waste focus on organising public awareness campaigns to raise consumer awareness of food waste and on making people clearer about food label through educational activities. But stagnant food waste reduction figures and consumer attitudes suggest that this policy is having a very limited effect. Making consumers understand the importance of reducing food waste only is hardly enough to make them change their behaviour, compared to entrenched eating and consumption habits.

Underlying reasons for food waste	Food-Related household practices	Measures to reduce and prevent food waste
Meaning		
Insufficient awareness of food waste and its impact	Motivations	<ul style="list-style-type: none"> - Awareness-raising campaigns on the importance of reducing food waste for the environment and society - Educational programmes on food waste reduction and measures people can take

Lack of awareness about the amount of food wasted they caused	Motivations	<ul style="list-style-type: none"> - Measures around social proof, such as setting standards for measuring a household's level of food waste. - Compulsory segregated collection and tax or disposal fee for food waste - Public awareness campaigns, e.g. A weekly food waste diary or metering. - Regulations on waste reduction targets and mandatory management plans
No psychological burden or moral condemnation	Motivations	<ul style="list-style-type: none"> - Reinforce the message that wasting food is bad, unnecessary and unethical
Material		
Promotions	Shopping	<ul style="list-style-type: none"> - Supermarkets remind consumers to consider storage and food waste issues by putting up posters or slogans, etc. During promotional activities.
Food salering forms	Shopping	<ul style="list-style-type: none"> - Food suppliers and processors should offer as much variety of unpackaged food as possible without increasing transportation losses, allowing customers to choose how much to purchase. - Introducing pre-made mixed vegetable packs, offering small portion sizes with a variety of vegetable choices to satisfy some people's good provider identity
Packaging sizes	Shopping	<ul style="list-style-type: none"> - Reducing price differences per unit weight between different sizes of food products, thereby reducing the influence of price on irrational consumer spending. - Provide different packaging sizes
Refrigerator	Storing	<ul style="list-style-type: none"> - Tools that make better use of refrigerator storage space.
Food shelf life	Storing	<ul style="list-style-type: none"> - Research and efforts by food processors, packers, etc. To extend the freshness of

		food.
The portion size of food served by restaurants	Eating	- The restaurant offers different portion sizes.
Time and location limitation	Eating	- Provision of food storage equipment such as refrigerators in canteens, schools, workplaces, etc.
Competence and Knowledge		
Lack of habit of planning food shopping and meal	Planning	- Information campaigns and educational programmes on food shopping plans or meal plans
Inadequate predictive capacity	Planning, Cooking, Eating	- Information campaigns on home food consumption, e.g., Record the actual amount of food consumed in a week - Developing recipes with different portion size options based on serving size and family size by related organisations
Miscommunication with people living together	Planning	- Information campaigns
Incomplete plan implementation	Shopping	- Advocate for more detailed planning
Inadequate knowledge of food storage	Storing	- Educational programmes, lectures in schools, etc. - Initiative influencers to promote relevant content on Internet.
Unsystematic food storage management	Storing	- Smart refrigerator design - Home food management application development - Information campaigns and educational programmes on: <ul style="list-style-type: none"> • food storage and freezing; • how to store leftovers; • how to improve visibility in fridge.

Overprepared food	Cooking	-	Cooking skills training
		-	Use Kitchen equipment with assisted portion control
		-	Advocating for smaller food containers
Storage instructions on food packages	Storing	-	Regulations on storage instructions on food packaging, e.g. Clarifying the meaning of different dates and which information is necessary.
		-	Public campaign on the meaning of food date label
		-	Add more and clearer storage instructions to the packaging e.g. If opened, consume within 1 day.
Low acceptance of food that is not fresh and perfect	Managing Leftovers	-	Public campaign and educational efforts to foster the acceptability of foods that are older or nearing their expiration dates

Table 5.1 Underlying reasons and possible solutions

At the **Meaning** level, it seems to be a self-evident perception that reducing food waste is the right thing to do and is conducive to conserving resources and protecting the environment. But in consumers' view, reducing food waste seems not to have a high priority and they are not confident with their power to make a difference. In other words, this consensus on the importance of saving food to protect the environment and the future has not been a strong motivation for consumers to act.

This reluctance and lack of confidence about change is due to several things at meaning level. One is because food consumption and waste are so commonplace that many people don't give their food waste much thought. Their uncertainty and disregard towards their food waste frequently leads them to believe that the urgency and significance of decreasing food waste is lacking. The second is due to lack of moral discipline and psychological burden. Especially when they do not know how much food they waste, some consumers rarely feel guilty when they cause food waste, even if they know the importance and influence of reducing food waste. This lack of awareness of the current state of personal or home food waste relieves them of the moral and psychological burden of wasting food. They sometimes do not feel that they have wasted a lot of food, but the fact may be different from what they think. Therefore, enabling more people to have a clearer picture of the food waste they or their households have contributed to may be able to enhance people's understanding of the significance of reducing food waste. One way to address this issue could be to launch a campaign to measure or record household food waste. It would assist

in raising consumer awareness of the actual quantity of food waste they produce. Publishing pertinent standards is also necessary, such as the typical or anticipated daily amount of food waste per person.

At the **Material** level, the response of other stakeholders in the food supply chain affects the food waste generated by consumers. Producers of food should endeavour to prolong the shelf life of food, which would reduce storage pressure on consumers.. Depending on further research on the relationship between food package size and food waste, more appropriate food package sizes could be provided. According to information published by the Dutch government, uniting the entire food supply chain to combat food waste is one of its core objectives. The role of related efforts and institutional standards in reducing food waste is promising. This level of elements is the easiest for governments to interfere in through administrative methods. Infrastructure development and other related initiatives could also be considered. For example: setting up more segregated bins in public places such as roadside and stations; further promoting reusable cups; and requiring restaurants to provide doggy bags or advocating consumers to bring their own bags so that they have the opportunity to take leftovers home.

At the level of **Competence and Knowledge**, the most significant measures are public campaigns and educational programmes. Topics for campaigns and education about reducing food waste are numerous and include, but are not limited to, proper food storage methods, cooking tips, the importance of planning food shopping and how to plan better, and more. Also in today's society, information and education campaigns through social media are very effective methods. Influencers can directly make promotional content about knowledge, such as food labelling distinctions, food storage methods and management. Internet celebrities can also influence the public by demonstrating more sustainable and less wasteful lifestyles, such as posting videos or photos of food planning, well-managed fridges, meal-sized meals, and storage of leftovers.

Economic measures are also one of the main instruments of government intervention. In some countries, quantity- or weight-based food waste charging systems have also been used to incentivise consumers to reduce food waste. Taxes or disposal fees related to food waste seem to be considered as one of the measures to reduce waste (UNEP, 2014). There is no doubt that such systems can significantly increase consumer awareness of food waste and understanding of its significance. Consumers are also more likely to take the initiative to learn about food waste reduction skills and knowledge in order to reduce the cost of disposing of food waste. However, this would also mean a significant increase in the cost of infrastructure and administration by the government. From the government's perspective, it is important to carefully consider whether the (environmental, economic, and social) return on the reduction of food waste achieved by the implementation of such policies can compensate for the investment in infrastructure development and the establishment and operation of administrative systems.

It is obvious that there are not much initiatives available to the government to encourage individuals to cut down and avoid food waste. The majority of the interventions have

focused on information campaigns and educational campaigns. Such projects take time to show results, and evaluating the effect of their execution is challenging. This study's analysis shows that a variety of topics need to be covered in food waste education and communication efforts. The Dutch government has implemented multiple programmes in the past few years, such as public awareness campaigns and educational programmes about food labelling. As is shown, campaigns for education and knowledge are unlikely to be as extensive as they have been in recent years. Therefore, further investigation and analysis are required to identify the elements that have the greater influence on lowering food waste so that subsequent interventions can focus on them.

5.2 Reconfiguration of food waste reduction practice

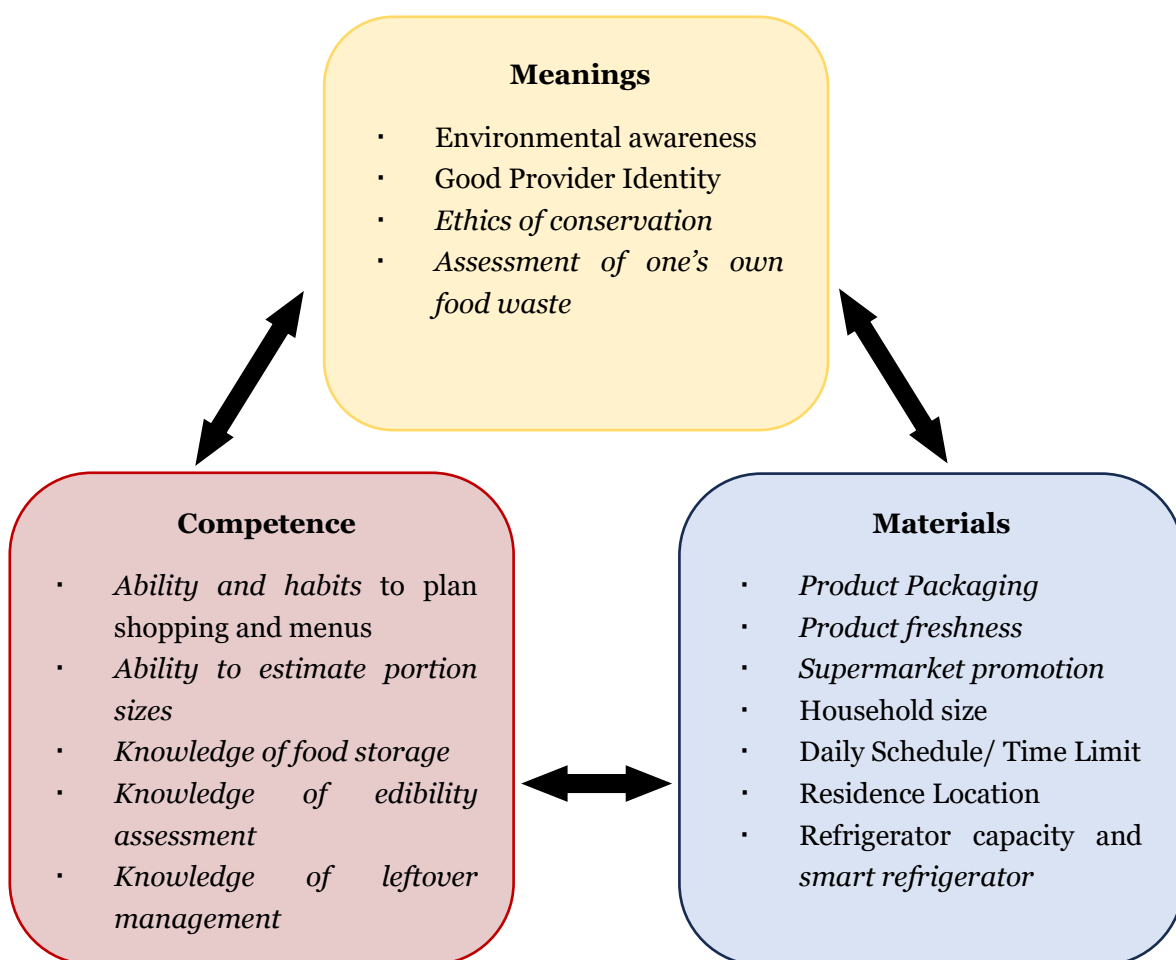


Fig 5.2 Reconfiguration of food waste reduction practice

According to the analysis in Chapter 4, some suggestions and potential solutions to change consumers' food waste behaviour were made through investigating into and evaluating the possible causes and real-world barriers of consumer behaviour. The social practice theory states that in order to reconstruct social practice, the three elements - Material,

Competence and Meaning - need to be altered or the practice framework need to be re-crafted. It must be recognized that the food consumption and waste by consumers is a rather complicated social practice, which includes many other social practices. They are intertwined, such as commuting, shopping, cooking and littering. How to make use of the complex interaction between these practices, so as to make this interrelated practice change? This problem is quite complicated, and considering the limited means of intervention at present, this study changes the three elements of social practice to form a new framework of social practice of consumption and food waste.

Figure 5.2 illustrates the reconfiguration of the three elements of future food waste reduction practices for Dutch consumers. The words in bold indicate improvements or changes in existing elements or new elements in the process of practice transformation.

Firstly, evaluating one's personal food waste can make people more conscious of the need for reducing their food waste. Simultaneously, people's ethical awareness of food conservation needs to be strengthened. As a result, people are more motivated. A stronger commitment to preventing food waste may result in a higher desire to acquire the necessary skills and knowledge. Acquiring knowledge and skills will also make people more conscious of the need to minimise food waste and more adept at conserving food. A willingness to prevent and reduce food waste may result in a change in the food suppliers and distributors. The availability of more reasonable or adaptive food and food packaging might objectively decrease food waste for customers who might not be as aware of it, as well as possibly bring it to their attention.

While a considerable number of elements are recognised as capable of causing practice transformation (compared to Fig 2.4), it is difficult to identify which elements are key to causing practice transformation. It is therefore questionable whether changes in these elements will ultimately contribute to the goal of halving food waste by 2030.

5.3 Limitations

A limitation of this study is the relatively homogenous study population. The respondents selected for this study were all studying at the Wageningen University. They are young, come from different countries and most of them have a relevant academic background. Therefore, they are not representative of the Dutch population as a whole in terms of eating habits, consumption habits and environmental awareness. The conclusions and recommendations reached in this study are not sufficiently applicable and persuasive. However, the process and results of this study also show that the analysis of consumer food waste prevention and reduction practices through the conceptual framework of social practice theory is effective and creative. By analysing each stage of the food consumption process in detail, more opportunities that can contribute to the reduction of food waste are identified.

The timing of the empirical investigation is another study limitation. The food waste diary for this study was just one week long due to the thesis's time constraints and the

respondents' willingness to participate. In research about food waste measurement, a week is a partially brief duration that might not adequately capture an individual's typical food consumption habits. It's possible that some respondents made errors or omitted information during the recording procedure. Each of these factors raises the possibility of bias in the information gathered.

6. Conclusion

Employing the Dutch government's commitment to halve consumer food waste by 2030 (SDG 12.3) and the challenges it faces as a starting point, this study applies social practise theory as a conceptual framework to analyse and investigate the factors influencing Wageningen University students' practises related to preventing and reducing food waste. A week-long food waste diary and the ensuing interviews allowed for an in-depth study of the behavioural patterns, psychology, constraints, and other aspects of consumer food consumption behaviour in everyday life. Under the direction of social practise theory, factors influencing consumer practises to prevent and reduce food waste were examined and analysed in three levels: material, competence, and meaning. Meanwhile, suitable solutions and measures will be suggested. Based on these investigations and analyses to answer the research questions of this study: *What are the factors that influence people to generate and reduce food waste in their daily practice?*

First of all, it is widely accepted that protecting food supplies is both morally right and essential. But there hasn't been much of a driving force behind practise due to this consensus or value. The reason for this kind of value-action gap is frequently people's conflicting feelings about waste prevention. It suggests a contradiction between ethical and moral goals of cutting down on food waste and individual desires for freshness, flavour, and safety in food. The target group of this study were students from Wageningen University, where the proportion of international students is also quite high. This group has a high level of environmental awareness and an academic background, and also shows a demand for high quality food. However, few indicated that their food saving behaviour was driven by a sense of resource conservation or environmental protection. This tends to suggest that consumers are not primarily motivated to take action by the social, economic, or environmental benefits of decreasing food waste. Rather, customers are more driven by their own moral indignation and financial restrictions when causing food waste.

Customers frequently lack awareness of the knowledge and abilities required to reduce and avoid food waste. For example, they don't think they're deficient in the capacity to plan food purchases and meals or understanding on how to store food. Food waste results from these procedures being neglected, and their carelessness or forgetfulness are frequently blamed for this. While there appears to be a lot of potential for advancement, it's crucial to remember that distributing relevant skills and information widely takes great effort.

While focusing on strategies that individual consumers can adopt to prevent food waste, the broader social, economic and cultural structures may have a role to play in promoting less food waste. Consumer food (waste) practises are greatly influenced by infrastructure, including supermarket chains, grocery stores, open markets, and so on. Storage facilities, such as floor fridges, also play an important role in this regard.

In addition, at different phases of food-related practises, there were delays or departures from planned because of the complexity and unpredictability of daily routines. This is a

major barrier to reducing food waste, such as impulsive or frequent buying. The problem is rather complicated and affects a number of areas, including sales, transportation, working or studying routines, and more. Thus, more study is needed to find out how people's behaviour related to food waste can be influenced by factors like daily scheduling, commuting, perceived time availability, etc.

The generation and prevention of food waste is a highly complex and multifaceted issue, driven by multiple causes and elements. This study shows that preventing and decreasing food waste is a complex procedure that involves a number of interrelated factors that both influence and constrain each other. The aim of this research was attempted to investigate and expand upon the existing reasons and alternatives regarding practises that both increase and decrease food waste. This study's primary shortcoming is not being able to broaden the target group's demographic and background. Therefore, the generalisability of this study may also be questioned. However, the aim of this thesis is to explore the application of social practice theory to the topic of food waste reduction and to expand the body of knowledge on the variables influencing food waste practises. If representative or more practical results are required, more thorough and in-depth research is needed.

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8. Appendix

Appendix 1. Food waste diary form

Definitions of recording sheet:

1. Food income: The food you get from supermarket, grocery, restaurant, and other places. Food packaging methods and size may be influenced by the food's source. And please record how you preserve the food when you bring it home. It would be nice if you can also take photos of your storage methods or places!

2. Food Waste: Here the food waste refers to leftovers and whole unused or part consumed food. Preparation residues like outside leaves of lettuce, peelings, apple cores, bones, etc. are not included. The precise amount of food waste is not needed in this survey. But you can keep track of approximate quantities, like half a packet of softened crisps.

3. Deposit: How you dispose of your food waste. e.g. by throwing it in the organic bin, by not sorting it, or by other means (e.g. composting, animal disposal, etc.).

Food Waste Record Sheet							
				Nationality:		Home size:	
Day	Food income			Food Waste			Pictures of storage conditions
	Food	Source	Storage method	Food	When did you waste	Reasons	
1							
2							
3							
4							
5							
6							
7							

Appendix 2. Interview questions

Thank you for participating in this survey on food waste. Would you like to have more information about this issue or we can directly start? And as the start of this interview, let's first talk about food waste itself.

1. Do you know food waste is an important problem before?
2. Have you ever been conscious of saving food or reducing food waste? If so, where did this awareness come from? (For example, academic background, YouTube videos, lectures,...)
3. Have you taken any actions to reduce food waste? What are they?

Then I'd like to know more about your daily routine:

4. Where do you usually spend? Or where do you usually eat?
5. How often do you cook?
6. Do you bring food to the university? How?
7. When do you buy pre-packaged food (weekdays/weekends).

Then let's take a look of your food diary. We can read it from left to right, following the food consumption process.

So, the first is food purchase

8. How often do you make food purchases? (Based on diary) Is there any reasons?
 - Related to your daily route? (courses, sports, the distance to supermarket...)
 - Unconscious ...
9. Where do you often shop for food? Why?
 - Food habit / Daily route / Price / Freshness...
10. Do you buy certain packages (or non-packages)? Why?
11. Do you buy vegetables in plastic? Or not? What sizes do they buy?
12. Do you plan your food shopping? Why or why not?
13. Is price the reason for your choice, such as discount events?

Storage

Refer to photos of refrigerators or storage shelves

14. Living condition—space and facilities for food storage
15. How do you prepare or store food? It's a very general question. I will give you some examples. Like Cut the meat into desired sizes and freeze. Put food in food container or preservative bag. Pour a layer of oil over the top of the half-used tomato can,
16. Do you have some storage tips?
17. Have you ever wasted food due to improper storage? Do you think you need more knowledge about food storage? What kind of skills and knowledge do you think are needed?
18. Have you learned something about extending food freshness? From where?

Then let's look at food waste

19. From your diary or your recording, what do you think is the main reason of your food waste? over-purchase / wrong storage / wasteful habit/...
20. And the reason of it?
 - The number of people who dine? Size of the package? Cooking and storage methods? Or other reasons?
21. **If you are living by yourself,**
 - Do you think there is a difference between living with others or your family on buying, storing and wasting food? What do you consider to be the greatest difficulties and obstacles?
 - Can you list some habits you got from your family? Do you still follow them or not? Why?
22. **If you are living with other people,** do you think their habits make influence to you?
 - What habits did you learn from housemates?
 - What habits did you have but can you not practice anymore because you are sharing a house?
 - Are there practices you learned from housemates that reduced your food waste?
23. **If you are living with your family,**

- who take charge of food shopping in your house?
- what practices did you learn at home?
- What tips/ tricks did you get from your mom/grandma/ farther?
- How did your storage and waste practices change over time?

Potential for change

24. After this recording, how would you assess you currently food waste?
25. Do you perceive the food waste you cause differently than you did it before?
26. The Dutch government is committed to halving food waste per capita by 2030 compared to 2015. In order to reach this goal, food waste per capita will still need to be reduced by one third, based on the amount of food wasted per capita in 2022. From 33.4kg to 21.6kg. Of course, we don't talk about specific amounts. Just the general proportion. Do you think it is possible for you to reduce the amount of food wasted by another third?
27. Then which stage do you think is the most possible or effective for reducing food waste?
28. If you were consciously trying to reduce the amount of food waste, what actions would you most likely take? Will you stick to your current food consumption habits?
29. What do you think could help reduce food waste?