What A Wasteful Day!

Food Waste In The Daily Lives Of Dutch Households

"Jammer dat toch steeds die broodkapjes weggegooid worden."

"What a pity that the bread crusts are always thrown away."

Written by a 39 years old woman who shares her kitchen with four person.

A Master's Thesis Written By Robert Orzanna In The Programme Sustainable Development: Energy & Resources At Utrecht University, The Netherlands

1st Supervisor and reader: prof. dr. Ernst Worrell

2nd supervisor: Msc. Lotte Visser

2nd reader: dr. ir. Wina Crijns-Graus

Final submission date: 31.08.2015

Foreword

“Ik vind het altijd zonde als ik iets moet weggooien, dus ik probeer altijd goed af te meten zodat ik niet teveel maak. Gevoelens: jammer en onnodig.”

“I find it always annoying when I have to throw away something. Therefore I always try to measure properly so that I do not prepare too much. Feelings: Pity and unnecessary. ”

Written by a 27 years old woman who shares her kitchen with one person.

For the past two years I have been interested in the topic of food waste. I spent considerable amount of time trying to understand why food is thrown away although it is perfectly edible. I looked at different occurrences of food waste, from supermarkets to university caterers. In the recent time I discovered my interest in people's lifestyles and their ways of consumption. What I found triggered me to research this topic further. I realised that individuals are responsible for a large share of food waste in most of the wealthy countries I have lived in throughout my life.

I took this master's thesis as an opportunity to explore an entire world of people's daily life and its relationship to household food waste. What followed were nine months of an incredibly exciting time in which I have discovered much more new insights than initially expected. What had begun as a master's thesis limited in scope turned into an experience that has enriched me far beyond and has helped me to identify my desired pathway through life.

Acknowledging all its limitations, I sincerely hope that this thesis has not only helped me as an incredibly rich learning exercise, but can inspire individuals to utilise the insights that provide knowledge, to rethink their personal practices, and ultimately to transform everyday household practices to reduce the food wasted at home.

Acknowledgements

“Jammer, had ik nu nog wel zin in.”

“Pity, now I had indeed still appetite for it. ”

Written by a 49 years old woman who shares her kitchen with two person.

I want to express my gratitude to the following people that all contributed to make the past nine months of thesis work so enjoyable and worthwhile for my personal life. Ernst Worrell for leaving me with so much freedom to explore and find my own way within the thesis process. Lotte Visser for her constant help and advice, particularly in designing the open-ended responses questionnaire. Bas for his companionship in the 100-100-100 campaign and inspiring way of being so well-organised. ROVA for the internship opportunity to investigate household food waste in the context of their 100-100-100 campaign. Jesus Rosales Carreon for his openness whenever I wanted to talk about topics going beyond the thesis touching on aspects that truly matter in life. Nico, Marianne, Anna, Jonas, Diana and Agnese for deep conversations about life, relationships, ideas, and continued friendship. My housemates for one of the best winters and summers I have had in my life and a physical place that I call home by now. Joris, Coby and the entire Food Surplus Entrepreneurship Network (FSEN) for the multiple opportunities to share and discuss my research. Seats2Meet co-working space for providing me with a great working environment and the many relationships that I have built up. Finally, all people who shared their situations and feelings in the open-ended responses questionnaire.

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“Ik voelde me teleurgesteld en beschaamd.”

“I felt disappointed and ashamed.”

Written by a 23 years old woman who shares her kitchen with three person.

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1. The Global Unsustainabilities Of Food Waste

“Als ik voedsel verspil baal ik hier enorm van en het maakt dat ik extra alert ben op wat ik in huis heb en hoe ik dit op kan maken.”

“When I waste food, I am extremely fed up and it leads to that I am extra aware of what I have at home and how I can use these.”

Written by a 32 years old woman who shares her kitchen with nobody else.

Food waste has been recognised as a global problem with tremendous environmental, social, and financial impacts [1–3]. In their latest assessment report, the Food and Agricultural Organisation of the United Nations (FAO) estimated that worldwide about one-third of all food produced for human consumption is lost or wasted every year. This amounts to an estimated 1.3 billion tons of edible food each year [4].

From an ethical and social perspective, wasting food seems irresponsible in light of the approximately 805 million people in the world who do not have sufficient food to lead a healthy and active life, despite all the engagement to eradicate extreme poverty and hunger in the course of the agenda of the millennium development goals (MDG) set out by the United Nations [5]. This number does not include the recent increase of food insecurity in countries of the traditional 'Global North' which is represented by a rise in the number of people who depend on food donations as a result of increasing financial inequalities and income disparities [6]. Taken together with population growth estimates for the upcoming decades, reducing food waste can be seen as one elementary strategy to provide sufficient 'good' food to nurture a future population of 9 billion people [3,7].

From an environmental impact perspective, the total volume of food wasted globally is responsible for an estimated 3.3 gigatons of greenhouse gas equivalents[1] (GHG), making food waste theoretically the third-largest emitter behind the USA and China [8]. Moreover, food that is produced in vein uses 250 km^3 of water, which is three times the volume of lake Geneva, and 1.4 billion hectares of land, which represents 28 percent of the land surface area used for agriculture worldwide.

Lastly, from a financial perspective, global food waste is associated with

[1] This number does not account for GHG emissions from land use change.

tremendous economic costs of $750 billion each year.[2]

Despite the acknowledged severity of the issue and engaging multi-level stakeholder discussions (see Figure 1) [9], reducing food waste remains a challenge for a variety of reasons. First, food waste occurs along the entire food supply chain (FSC): from (1) production, to (2) processing, (3) distribution, (4) retail and (5) final consumption.

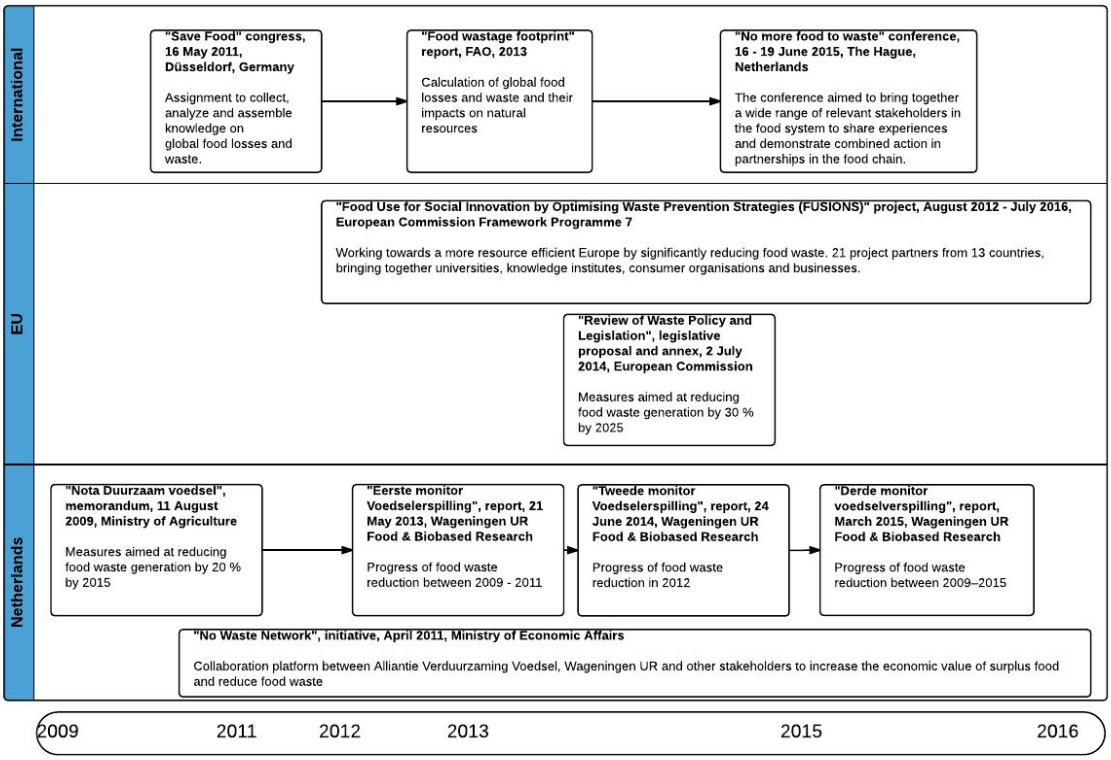

Figure 1: Timeline of significant food waste-related events on an international, European, and Dutch national level between 2009-2016.

Consequently, it requires multiple institutional actors, organisations with different (economic) incentives and not always rationally acting consumers to work together on the total reduction of food waste along the FSC.

[2] This number excludes the cost associated with losses from fish and seafood.

Second, the non-utilisation of food originally designated to human consumption occurs for varying reasons in different world regions. In countries of the traditional 'Global South', food is often 'lost' at the postharvest stage due to inefficient processing technology and insufficient distribution infrastructure. In these situations, food losses could thus be partially reduced by assisting technology transfer and technological investments from developed countries to the countries suffering from postharvest losses [10]. In developed countries of the 'Global North', food is to a large extent intentionally 'wasted' at the production stage due to unconformities with market norms ('ugly fruits') or for a variety of reasons disposed by end-consumers at the household level [2,3].

In acknowledgement of the multi-faceted problem of food waste, national and supranational governments have started to take serious efforts to significantly reduce household food waste in the upcoming years. The European Parliament, for instance, announced 2014 to be the 'European year against food waste' [11] and consequently set an ambitious target to reduce food waste along the FSC by 30 percent by 2025 [12].

In the past years, the success of reducing household food waste differed greatly between countries. The United Kingdom, for example, has been among the most active countries in pursuing efforts to reduce household food waste, and revealing the unprecedented levels of food waste in UK homes thanks to the work of the Waste and Resources Action Programme (WRAP) [3]. Following a series of research projects and public intervention campaigns conducted by WRAP [13–15], between 2007 and 2012, the UK managed to achieve a reduction of avoidable household food waste by 21 percent according to the latest figures [14].

2. The Challenge of Household Food Waste

“Ik vind het altijd zonde als ik iets moet weggooien, dus ik probeer altijd goed af te meten zodat ik niet teveel maak. Gevoelens: jammer en onnodig.”

“I find it always annoying when I have to throw away something. Therefore I always try to measure properly so that I do not prepare too much. Feelings: Pity and unnecessary.”

Written by a 27 years old woman who shares her kitchen with one more person.

On an European level, there is broad consensus that private households are significant contributors to the total volume of food waste in the EU. In comparison to less affluent world regions like Africa or Latin America, the share of consumer food waste is among the highest of the entire FSC and comparable to the large shares of North America, Oceania and industrialised Asia [16].

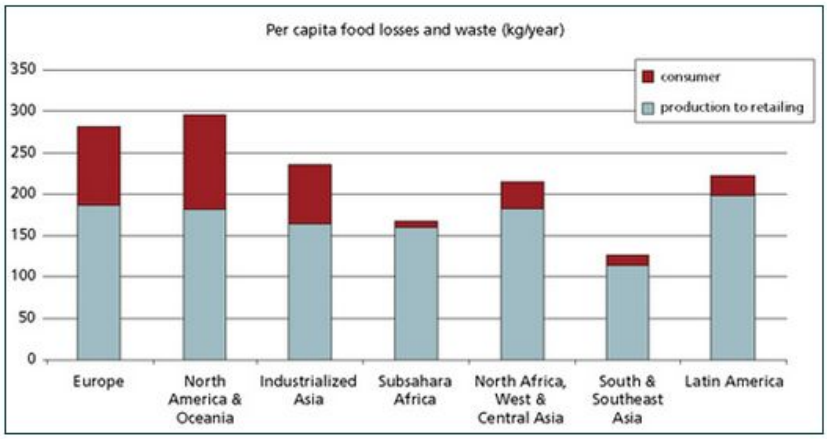

Figure 2: Consumer-related share of food waste along the food supply chain in comparison to production to retailing in different areas of the world [16].

Among the food that is wasted by European consumers, the share of the perfectly edible fraction is among the highest of the world regions and only superseded by the larger share of North America and Oceania [17].

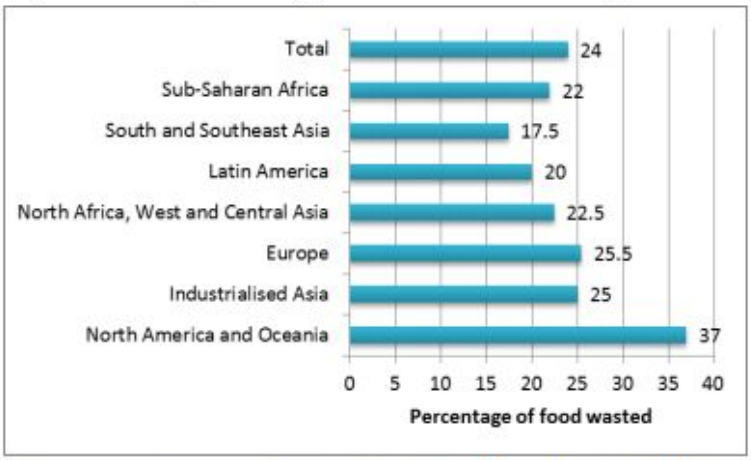

Figure 3: Percentage of edible parts of food waste (in kcal) in the different areas of the world [17].

Aside this severity of the problem on the consumer side, for my master's thesis I therefore decided to focus on a comprehensive study of food waste that occurs in the private realm of households, with an exclusive focus on the lives of Dutch households.

Comparably to other affluent countries, food waste by Dutch households represents the single-largest fraction of food waste that occurs along the FSC [3]. When discussing food waste, I will follow the existing definition that most of the studies on household food waste employed [13,18,19]. These studies commonly distinguish three fractions of household food waste: (1) avoidable, (2) possibly avoidable, and (3) unavoidable:

1. Avoidable food waste was at some point, prior to its disposal, edible in the vast majority of situations. A UK study conducted by the WRAP organisation found that about 60 percent of UK household food waste can be considered avoidable and is therefore perfectly suitable for human consumption [14]. A comparable share was found for Dutch households which amounted to 54 percent avoidable food waste found in the residual and GFT stream [20]. In

absolute numbers, Dutch households rank among the middle in comparison to other European countries (see Table 1). Households in Nordic countries generally produce less avoidable food waste whereas households in other Western European countries, including the United Kingdom despite its achieved reductions, produce more avoidable food waste than Dutch households.

2. Possibly avoidable food waste could have been eaten by some people but is not considered edible by everyone (e.g. bread crusts). Moreover, it could have been eaten when food is prepared in one way but not in another (e.g. acceptance of the use of potato skins in different potato dishes).
3. Unavoidable food waste arises as a residue from food preparation and is not edible under normal circumstances (e.g. bones or peels).

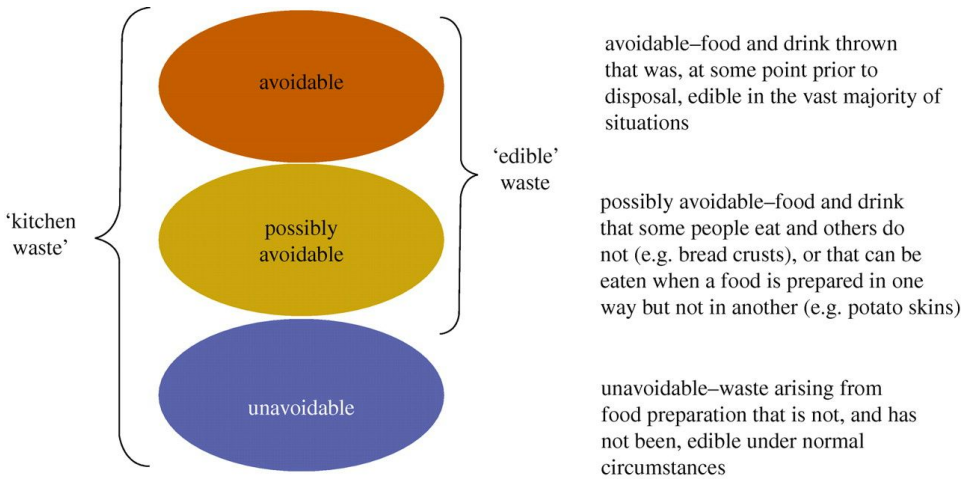

Figure 4: Classification of kitchen waste into the three categories of avoidable, possibly avoidable, and unavoidable household food waste [21].

Table 1: Avoidable household food waste for Finland, Germany, the Netherlands and the United Kingdom found in recent studies [14,18,20,22].[3]

Country	Source	Avoidable food waste (kg/capita/year)
Finland	Juha-Matti Katajajuuri et al. (2014)	23
Germany	WWF (2015)	61
Netherlands	van Westerhoven (2013)	47
United Kingdom	WRAP (2013)	109

Given the large share of the avoidable fraction of more than half of the total volume of Dutch household food waste, I therefore decided to limit the focus of this master's thesis to the avoidable household food waste fraction. Whenever referring to food waste, or household food waste, I consequently treat them synonymous to the avoidable fraction of food waste of Dutch households. In defining food waste, I follow existing definitions of the UK organisation WRAP [21] and the Dutch organisation CREM [20]. Both define household food waste as follows:

> Household food waste refers to edible, avoidable and possibly avoidable, food purchased or cooked with the purpose of human consumption at home but remains uneaten and is discarded.

This definition includes all foods that under normal conditions can be eaten and that are considered edible at least by some people. It intentionally excludes unavoidable food waste such as peels and bones.

[3] The numbers must be compared with caution due to different assessment methods used. A standardised assessment protocol is currently being developed by the World Resource Institute (WRI). For more information see:

http://www.wri.org/our-work/project/food-loss-waste-protocol

3. The Current State Of Dutch Household Food Waste

“Ik was enerzijds blij om van de bleekselderij af te zijn, omdat ik hem smerig vind, anderzijds zonde van de groente.”

“On the one side, I was glad that I got rid of the celery because I find it disgusting. On the other side, sinful for the vegetable. ”

Written by a 20 years old man who shares his kitchen with two more person.

The latest data indicate that in the Netherlands 800 million kilograms of food is wasted every year [23]. This tremendous amount leads to financial costs of 2.4 billion Euro and corresponds to 3.5 percent of the annual Dutch carbon dioxide emissions. On a per capita basis, this amounts to 47 kilograms and associated financial costs of 150 euro, reflecting 14 percent of the food that is purchased in vain [20,24].

Moving from these national figures to the figures for households, in 2012, Dutch households were responsible for 38 percent (0.6 to 1 billion kilograms) of the entire volume of food waste in the Dutch food supply chain, which was estimated to be between 1.7 and 2.6 billion kilograms [25]. Along the entire chain, households thus hold the largest share, followed by agricultural producers with 23 percent, the hospitality industry with 14 percent, the processing and storage industry with 12 percent, supermarkets and retailers with 9 percent, and the food industry with 5 percent [26].

Given the severity of the issue, the Dutch government announced the goal to reduce food waste along the entire food supply chain by 20 percent in 2015, and recognised food waste as a critical waste stream whose environmental impact needs to be significantly reduced [27].

4. Scientific Background And Previous Studies On Dutch Household Food Waste

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“Bah, schimmel.”

“Bah, mould.”

Written by a 25 years old woman who shares her kitchen with one person.

Over the past years, a large body of literature has emerged on Dutch food waste. Using Google Scholar, I identified 87 results for food waste in the Netherlands[4], and 33 results for household food waste in particular[5]. For household food waste, these results can be categorised into three distinct themes: (1) quantification of waste (how much), (2) reasons for wastage (why), and (3) solutions to reduce wastage (how to reduce). In the following, I briefly summarise the main highlights of the three themes.

I begin with quantification of waste. With 18 percent, bread is the number one product disposed by households on a weight basis, followed by vegetables with 13 percent, fruits, rice and pasta with 12 percent, and potatoes with 9 percent [20]. There is a large variety of the composition and amounts of food waste among different social groups. Households that tend to waste more than average are single households, families with young children, and the youth (especially under 25). Moreover, people on higher income and people who work tend to waste more [28–31].

[4] Keyword: “voedselverspilling nederland”

[5] Keyword: “voedselverspilling huishouden nederland”

Table 2: Avoidable food waste products found in the residual and green (GFT) stream of Dutch households [20].

Product	Percentage in residual and GFT stream
Bread	18
Vegetables	13
Fruits	12
Rice and pasta	12
Potatoes	9
Dairy (incl. cheese)	8
Meat	8
Sauces and fats	7
Cakes and biscuits	4
Meal leftovers	2
Other	7

Now I continue with the reasons for wastage. Previous studies that looked at the reasons for the occurrence of Dutch household food waste found these to be comparable to those found in other countries [see 32]. The most prevalent include over purchasing, over preparation, and improper storage of food products. Wasting food, however, is not a voluntary behaviour. When surveyed, 70 percent of Dutch households say that they are willing to reduce food waste for the following reasons [33]: (1) 67 percent say that wasting food is against social norms; (2) 61 percent say that it is simply cheaper not to waste food; (3) 41 percent are concerned that there are people who suffer from hunger; (4) 31 percent believe that not wasting food saves the environment; (5) and 17 percent believe that not wasting food saves resources and is thus beneficial to the economy. Another study even found a larger share of 90 percent of Dutch people who were found to express the intention to reduce their food waste [30,33].

The above results highlight that environmental impact is a less strong motivation to reduce personal food waste [28] and that financial and social aspects play a larger role in creating an intention to reduce wastage [29]. Yet despite this high willingness, the total volumes of Dutch household food waste have not changed significantly since 2010 [20,30]. Several studies have found a number of

barriers that impede household food waste reductions [20,30,34–36]. Those barriers are summarised in Table 3 for different food-related practices and different product groups.

Table 3: Reported reasons for households to waste different food products. Adapted from [37].

			Product groups								
Practice	**Reasons for wasting food**	**%**	**Dairy**	**Bread**	**Vegetables**	**Fruits**	**Sauces and fats**	**Potatoes**	**Meat**	**Rice and pasta**	**Cakes and biscuits**
Cooking	Prepared too much	47			x		x	x	x	x	
	Prepared food in the wrong way	9			x		x	x	x	x	
Storage	Forgotten to have the product at home	41	x	x	x		x				x
	Did not find a use for leftovers	39	x	x	x		x	x	x	x	
	Did not store product properly	30	x		x	x	x	x	x		
Purchase	Too much food in package	18	x	x	x	x			x		x
	Purchased too many items of a product	13	x	x	x	x	x	x	x		x
Eating	Did not like the taste	29	x	x	x	x	x	x	x		x
Other	Spent not enough time at home	32	x	x	x				x		x
	Did not have enough time to consume the product	21	x	x	x	x	x	x	x		x

With 47 percent, having prepared too much was the most frequently reported reason for consumers to waste food and occurs mostly in connection to vegetables, sauces and fats, potatoes and, meat, and rice and pasta. The second-largest reasons refers to people forgetting of food products that they still have at home. This is mostly connected to dairy products, bread, vegetables, sauces and fats, and cakes and biscuits. The third-largest reason for wasting food is the inability to find appropriate use for leftovers, mostly in connection to dairy products, bread, vegetables, sauces and fats, potatoes, meat, and rice and pasta.

Finally, I want to address the existing solutions to reduce food waste at home. Previous studies promoted behaviour change during the practices of purchasing, cooking, and storing of food, the most prominent intervention for the Netherlands being the ‘FOOD Battle’ [38]. The FOOD Battle was launched in

September 2012 as a collaborative project between several Dutch supermarkets, Wageningen UR Food & Biobased Research and the waste management company 'Circulus en Berkel Milieu'. The results showed that the awareness of own behaviour in connection to food waste increased for participants of the FOOD Battle.

This was achieved by providing participants with information about problematic topics, such as the common misunderstanding of the Dutch expiry date 'THT' ('tenminste houdbaar tot'), or knowledge on where to store which food products properly. Moreover, participants were provided with tips and tools, such as adjusted household practices to save leftovers if they occur, using a purchasing list, or a cup to measure and portion food.

In evaluating the existing interventions, there is the tendency to use interventions that target knowledge, attitudes and the behaviours that individuals choose to undertake [2], also known as the 'ABC' (attitude, behaviour, change) framework [39]. The fundamental assumption underlying these interventions is that they continue to individualise responsibilities for affecting change [40]. It is assumed that by providing individuals and households with the right information, households can easily apply these in their lives to reduce food waste at home. Prominent examples include tips such as [41]: buy only what you need; weigh pasta, rice and couscous; look, smell and try a product; store your food products at the right place; make a good plan for your meals.

What is striking is that all these efforts and designed interventions have not yet led to a significant reduction in the amount of avoidable food waste found in Dutch households. According to the third monitor report on the latest state of food waste in the Netherlands, published in March 2015, the announced goal of reducing food waste by 20 percent in 2015 is unlikely to be met [42]. Between 2009 and 2013,

no achievements had been made to reduce food waste. After a small increase in 2011, the numbers fell back to the level of 2009. In 2013, total food waste amounted to between 1.83 and 2.71 million tons. This equals an amount of 109 to 162 kilograms per capita per year.

Looking specifically at the changes to avoidable food waste at the household level, this fraction did not decrease significantly either. As shown by Figure 5, avoidable household food waste reduced by only 7.5% per capita per year between 2010 and 2013 (from 37.4 kilograms in 2010 to 34.6 kilograms in 2013) [20].

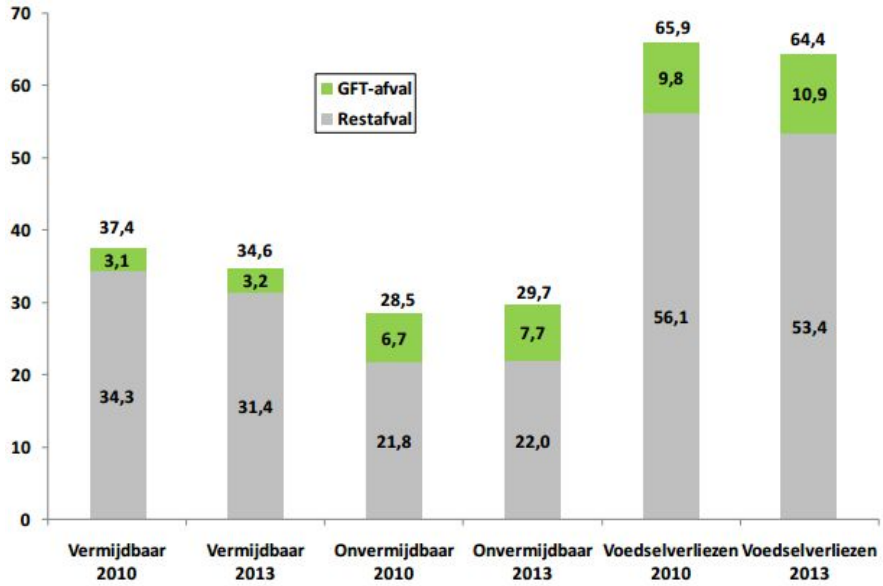

Figure 5: Avoidable (vermijdbaar) and unavoidable (onvermijdbaar) household food waste found in the green waste stream (GFT-afval) and residual waste stream (Restafval) of Dutch households. Volumes are provided in kilograms per capita per year [20].

These insignificant developments are noteworthy in light of the previously mentioned high willingness of Dutch households to reduce their own food waste. The main question I intend to raise is why expressed ambitions and defined targets

to reduce food waste [11,43] as well as previous intervention campaigns [44] so far have not lead to a significant nationwide decrease [20,42]. Or to put it differently, why do these interventions not work as they should as prescribed by the ABC approach? How can household food waste be framed differently to understand the deeper underlying issues at hand?

5. Existing Theoretical Concepts To Understand Household Food Waste

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“Ik baal er meestal van omdat het zonde is van het eten en het geld.”

“I mostly hate these situations because it is sinful of the wasted food and money.”

Written by a 24 years old woman who shares her kitchen with one more person.

The most prominent theoretical framework existing to understand the complexity of household food waste was developed at WRAP in the UK [45]. Their framework adopts a systemic level perspective in which the amount of avoidable household food waste, and thus the environmental impact, is the result of behaviours performed by individuals and households that influence food waste. These behaviours, in turn, are related to an individual's: (1) attitudes and values, (2) motivation, (3) habits, (4) perceived social norms, (5) knowledge and skills related to the performed behaviours, (6) awareness of the issue of food waste, (7) and existing facilities and resources that the households has access to.

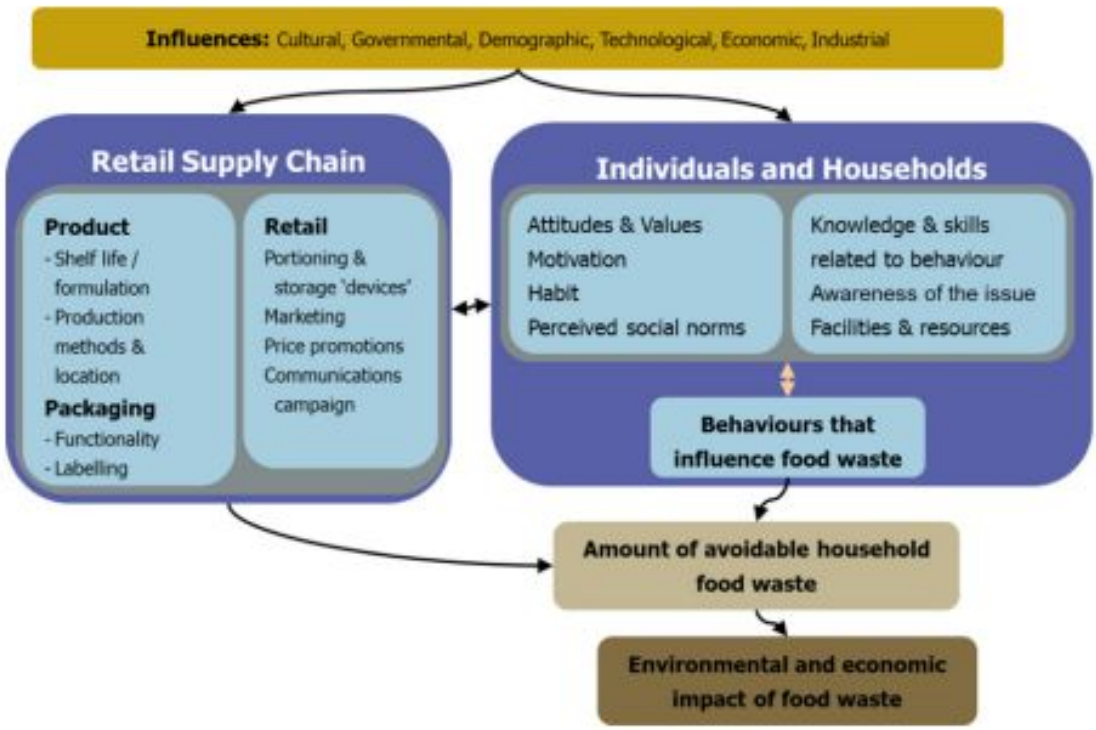

Figure 6: 'Conceptual Framework' to understand occurrence of food waste at home [45].

Notably the framework acknowledges that behaviours and practices associated with food waste generation (and prevention) are a complex construct

and food waste thus results of multiple, interacting activities which lead to the separation between the activity and their consequences. People's behaviours are usually performed for reasons unrelated to waste prevention and have both a marked habitual element and a pronounced emotional component. They discuss how these insights have been used to develop a successful public-engagement campaign and compare these insights to commonly used behavioural models, highlighting that many of these models are not designed for multiple, complex behaviours. They conclude that considering food waste through the lenses of multiple academic disciplines has helped the development of the public engagement on food waste.

The strengths of the systemic level perspective of the framework are twofold. First, it recognises that generation of food waste is not a behaviour in itself but results from the interaction of multiple food-related behaviours. Second, it takes into account that individuals and households are not isolated actors but embedded in a system. This system influences individuals and households through a direct relationship with the retail supply chain with very immediate impacts on behaviours due to product, packaging, and retail characteristics. Influences such as cultural, governmental, demographic, technological, economic, and industrial further affect households and individuals and corresponding behaviours although in a less direct way.

In recognition of the complex embeddedness of individuals and households in a larger system of actors and influences, I decided to add a sociological approach to my study on food waste to more appropriately describe the occurrence of household food waste in the context of the interconnectedness of households with larger systems. This sociological approach employs three elementary concepts.

First, it notes that the home is where most of what matters to people is happening [46], making the home thus a logical physical place to focus this research upon. Second, it takes into account the importance to understand the ways in which the practice of eating is embedded in the flow of day-to-day life [47]. Third, it acknowledges for the need to look at the ways in which so-called 'waste behaviours' relate to the contemporary dynamics of everyday life [40]. With his sociological approach, Evans [40,48] provides a detailed starting point investigating the reasons for household food waste. Evans conducted a small scale, non-representative ethnographic study exploring how and why food is wasted in households. The study presents three in-depth and intimate snapshots of the portrayed households. It looked at processes, practices and dynamics that play a role in the occurrence of household food waste. The study highlights that food waste is a more or less mundane consequence of the ways in which domestic practices are socially and materially organised. Evans follows with three three main conclusions. First, people do not carelessly throw away food just like that. Instead they use complex procedures to free themselves from the guilt of having wasted food. Second, food is routinely over- provisioned. Third, it is important to consider the social and material context of food practices. The social context includes time, tastes, conventions, family relations, and domestic division of labour. The material context includes domestic technologies, infrastructures of provision, and materiality properties of food itself. Evans concludes that he cannot confirm the thesis of the careless household living and adhering to the principles of a 'throwaway' society.

In his study, Evans [40] noticed a tendency to blame the consumer by individualising responsibilities to affect change towards achieving household food waste reductions. He performed an ethnographic study to demonstrate the dynamics of domestic food practices. He discusses his results around four themes:

1) feeding the family, 2) eating 'properly', 3) the materiality of 'proper' food and its intersections with the socio-temporal demands of everyday life, and 4) anxieties surrounding food safety and storage. His results show that household food waste cannot be conceptualised as a problem of individual consumer behaviour alone due to large influences of social and material contexts in which households are embedded in. Thus he concludes that policies have to target social and material conditions in which food is provisioned.

In a subsequent sociological analysis, Evans [48] provides a more detailed critique on the fact that volumes of waste are used to infer the presence of a throwaway society. Using ethnographic examples, he illustrates the ways in which the passage of food into waste arises as a consequence of the ways in which domestic practices are socially and materially organised. In his study he pays special attention to (1) routines of household food provisioning and the contingencies of everyday life, (2) the social relations manifest in the enduring convention of the family meal and (3) the socio-temporal context of food practices. He concludes that a sociological approach to home consumption, material culture and everyday life can usefully engage with public and policy concerns about origins and consequences of food waste.

I took these existing theoretical insights and subsequently framed my research from the lense of a systemic level perspective and everyday life contingencies.

6. The 100-100-100 Experiment

“Ik vond het vervelend. Ik probeer juist geen voedsel weg te gooien e heb aangedrongen dat mensen van mijn salade moest eten, met weinig succes helaas.”

“I found it annoying. I try to not waste food and have urged the people to eat my salad, however with little success.”

Written by a 23 years old woman who shares her kitchen with nine other people.

During my research I had the opportunity to participate in the design and evaluation of an experimental public engagement campaign titled “100-100-100”. The campaign involved almost 400 households from several Dutch municipalities in the operating area of the public waste management company ROVA.[6] The campaign ran from 1 January 2015 until 10 April 2015. Its goal was to identify factors that can stimulate less waste production and improve waste sorting behaviour on a household level and contextualise the required changes at a systemic level to reduce the perceived efforts for households for achieving the aforementioned objectives.

Voluntarily participating Dutch households aimed at a reduction of their residual waste by (1) improved waste sorting, i.e. proper sorting of previously incorrectly disposed residual waste in the designed streams (GFT, plastic, paper) and (2) waste reduction, i.e. reducing the absolute amount of waste produced in the homes. In the team we decided that my role in the experiment was to focus on food waste with regard to composition, quantities, reduction potentials and sorting behaviours to align it with the research interests for my master’s thesis.

[6] Participating households were from the municipalities Steenwijkerland, Hardenberg, Ommen, Westerveld, Winterswijk, Aalten, Oost-Gelre, Zwolle, Hattem, Zwartewaterland, Dalfsen, Staphorst, Urk, Olst-Wijhe, Raalte, Twenterand.

7. Research Questions

“Ik verspil nooit voedsel, want daar voel ik me niet goed bij.”

“I never waste food because I don’t feel well while doing it.”

Written by a 28 years old man who shares his kitchen with nobody else.

The previous chapters led to my main research question:

> How does everyday life influence avoidable food waste in the homes of Dutch people?

I divided this question into the following four sub-questions:

1. How do food-related practices affect the over-provisioning of food and avoidable household food waste in the homes of people?
2. What are the commonalities and disparities found in two different clusters of households who participated in the 100-100-100 experiment with regard to systemic influences, retail supply chain influences, characteristics of individuals and households, behaviours that influence food waste, and the amount of avoidable household food waste produced during the experiment?
3. What are the social and material context factors that influence individuals and households?
4. How do social and material context factors influence individuals and households?

8. Methodology

“Ik voelde me net zo rot als de komkommer rot was… Ik was ontgoocheld in mezelf.”

“I felt as rotten as was the cucumber… I was disappointed by myself ”

Written by a 38 years old woman who shares her kitchen with nobody else.

My employed methodology consisted of three elements. First, I conducted a literature review on existing studies that looked at the relationship between everyday life and household food waste to address my first sub-question how food-related practices affect the over-provisioning of food and the amount of avoidable food waste at home. This led to two ethnographic studies by Evans [40,49]. I used the results of Evans to propose a theoretical scheme that helps to explain the occurrence of household food waste from the lense of everyday life contingencies (see Section 9).

Second, in the scope of the 100-100-100 experiment we used a combination of an online public engagement platform, two compositional waste analyses and three quantitative questionnaires. This employed mix of tools follows a recommendation of a synthesis review, published in 2010, on the delivery and impact of successful household food waste prevention intervention campaigns at the local level [50]. The study concluded that due to the complexity of behaviour, behaviour change is best supported by integrating a range of interventions tools and campaign promotions that together make a collective rather than isolated difference. In our study, households were 'enabled' to change behaviour through knowledge and information provided on the online platform and through a personal coach visiting the home of half of the participants group (the 50+ group). Households were further 'engaged' through the extensive and central use of the online platform, and 'encouraged' to change their behaviour by weekly thematic challenges.

I use these data to address the second to fourth sub-questions to identify commonalities and disparities between two household clusters. Households were able to register online prior to campaign begin. The information about the campaign was disseminated on several Dutch news channels. In total, about 400 households registered to participate in the campaign. Participating households

received weekly, thematic challenges through the online platform system. Of the almost 400 households, 100 households were selected and split into two groups, named 50+ and 50-, to analyse and monitor the success of the campaign interventions on waste reduction and improvements of sorting behaviour. The 50+ group received personal help both through the online platform (other households and editors from ROVA) and from an individual coaching at home. The 50- group did not receive professional coaching but had access to the online community.

On the online platform, households could place posts in four different categories. First, they could submit their response to a weekly challenge on different subjects related to waste production and sorting of different waste streams. Second, they could post a tip to share with others. Third, they could ask a question to be answered by the community or by an official ROVA editor. Fourth, they could post a general report not fitting any of the aforementioned groups.

For 90 households (of the 100 selected households)[7] the waste was collected after a duration of two weeks and a compositional analysis performed both prior to campaign start and after the end of the campaign. Other studies [51] employed the same two weeks time frame and employing this timeframe therefore seemed plausible. For cost saving reasons the 50+ and 50- groups were clustered into smaller groups to identify the influence of different factors on waste production and sorting behaviour.

[7] 10 bags were not retrievable from the households for several reasons.

Table 4: Clusters used for the compositional analysis, n=90.

ID	Group	Urban classification	Municipalities	Diftar	Reversed collectio	Number of households	Organic cutting waste (residual)	Food waste (residual)	Bread (gf)	Uncooked leftovers (gf)	Cooked leftovers (gf)	Organic cutting waste (gf)	Opened packaging (gf)	Unopened packaging (gf)
2A		50-	2	Zwolle	no	9	✓	✓	✗	✗	✗	✗	✗	✗
2B		50-	2	Zwolle	no	phase 2	9	✓	✓	✓	✓	✓	✓	✓
2C		50-	4/5	Dalfsen, Hardenberg, Hattem, Olst-Wijhe, Staphorst, Twenterad	yes	phase 1	19	✓	✓	✗	✗	✗	✗	✗
2D		50-	4/5	Steenwijkerland, Zwartewaterland	yes	phase 2	13	✓	✓	✓	✓	✓	✓	✓
1LB		50+	2	Zwolle, Genemuiden	no	no	6	✗	✗	✓	✓	✓	✓	✓
1HB		50+	2	Zwolle, Zwartewaterland	no	phase 2	6	✗	✗	✓	✓	✓	✓	✓
1A		50+	2	Zwolle	no	mixed	12	✓	✓	✗	✗	✗	✗	✗
1B		50+	4/5	Steenwijkerland, Zwartewaterland	yes	phase 2	10	✓	✓	✗	✗	✗	✗	✗
1C		50+	mixed	Dedemsvaart, Vriezenvee Hattem, Wijhe, Dalfsen, Hardenberg, Rouveen, Slagharen, Olst	mixe	mixed	18	✓	✓	✗	✗	✗	✗	✗
Control	Control group		4/5	Steenwijkerland, Zwolle Zuid, Zwolle Stadshagen	yes	phase 2	n.a.	✓	✓	✗	✗	✗	✗	✗

Note: Urban classification refers to the number of households per km2. 1=very urban, 5=very rural. Average household size in the 50+ group was 3.03 persons, and 3.10 in the 50- group.
Food waste quantity for the 50+ was estimated based on the ratios found for the 50- group.

The compositional analyses were performed by the Dutch research advisory bureau EURECO BV. The data were provided in Microsoft Excel format. Three household waste streams were measured: residual, plastic and organic waste (in the following GFT[8]). The applied method for the compositional analyses are equivalent to the annual analysis of household residual waste (Samenstelling Huishoudelijk Restafval in Nederland), commissioned by RWS Leefomgeving and conducted by EURECO BV. The compositional analysis method applied in this study shows some differences from the method used in other recent studies [20,see 36] on Dutch household food waste with respect to food disposed in the residual stream. First, dairy waste, as well as sauces and fats are not taken into account as GF waste while van Westerhoven [20,36] includes these streams based on the residue found in packaging. Second, meal leftovers cannot be properly attributed as such due to their very advanced composting; thus they were estimated based on previous measurements. Third, rice and pasta found in residual waste are assumed to be cooked and a result from meal leftovers.

An overview of the food waste classifications that I used to calculate the amount of avoidable food waste are provided in Table 5.

[8] Dutch: Groente, Fruit en Tuinafval (GFT) refers to the terminology used for the organic waste stream in the Dutch waste collection system.

Table 5: Food waste classification used in the compositional analysis.

Waste stream	Type	Separation	Condition	Definition
residual	organic cutting waste	✗	unavoidable	peels, trunks, rind
residual	food waste (cooked and uncooked)	✗	avoidable	cake and biscuits, meal leftovers, rice, pasta, sweets and snacks, sandwich spreads, sauces and fats, soups, others
gf	bread	✓	avoidable	
gf	leftovers (uncooked)	✓	avoidable	
gf	leftovers (cooked)	✓	avoidable	cake and biscuits, meal leftovers, rice, pasta, sweets and snacks, sandwich spreads, sauces and fats, soups, others
gf	cutting waste, bones, coffee residue, tea bags	✓	unavoidable	cutting waste, bones, coffee residue, tea bags
gf	leftovers (opened packaging)	✗	avoidable	visible leftovers from opened food packaging
gf	leftovers (unopened packaging)	✗	avoidable	food in sealed packaging

Note: ✗ indicates falsely sorted. ✓ indicates properly sorted.

Throughout the duration of the campaign, all households registered on the online platform, including the selected 100 households, were asked to fill in three questionnaires: the first prior to the start of the campaign (reference point), the second during the campaign, and the third after end of the campaign. For the questionnaire design we employed a systemic level perspective (see Figure 6). Since the primary focus of the 100-100-100 experiment was on general residual waste sorting and reduction, most questions did not relate specifically to food waste prevention behaviours as one set of pro-environmental behaviours. With regard to the questionnaire results, only one household member reported his or her responses. In the following, age of the household member is referred to the person who filled in the questionnaire. It is assumed that the person who filled in the questionnaire is also mainly responsible for all food-related tasks in the respective households. Without extensive knowledge on the food-related tasks within the household, the person would be less likely to see himself responsible for filling in the questionnaire.

For the data evaluation of the questionnaires I used the open-source software GNU PSPP to perform a factor analysis to identify variable groups and LibreOffice Calc to calculate the average responses for both household clusters. The scope of this report lies on the results relevant for food waste research. Therefore I decided to include food waste residing in the residual and GF streams and exclude the plastic stream due to the potentially neglectable fraction of food residue in packaging that is disposed in the plastic waste stream.

Third, I designed an open-ended responses web questionnaire to address my last sub-questions on the context factors that influence household food waste. The questionnaire asked respondents to describe a situation in which they had experienced food waste at home. Methodologically I decided to employ open-ended responses as they provide individuals with the freedom to explore their thoughts, feelings and reactions [52] towards household food waste in a way that they had not done before. Therefore I expected the qualitative responses to reveal thoughts, frames of reference, emotions and cultural assumptions that may or not be accessible by the employment of other methods [52,53]. I decided to use personal narrative and stories as they provide valuable information about the self-perceptions (including self-identity), life scripts, and beliefs in how the world works [52], and how these factors affect a person's perception on personal household food waste. Moreover, telling a personal story allows individuals to make sense of difficult events and to help them integrate these experiences with the personal self [52].

I designed the open-ended response alongside six important factors to ensure a sufficient response rate [54]: (1) aim, (2) length, (3) pilot study, (4) question order, (5) terminology, and (6) presentation.

First, I ensured that all questions asked addressed the *aim* of the research to

investigate food waste in the daily lives of Dutch households. In the first question the respondent was asked to describe a situation of the past two weeks in which he or she experienced food waste at home. I chose two weeks as the timeframe in order to be consistent with methods used in other studies [51]. The questionnaire allowed the respondents to upload and subsequently describe a specific situation of food waste using a photographic image. To my best knowledge, a photographic online survey had not been tested in previous studies. A photographic imaging method allows to visually identify and contextualise a specific situation of everyday life in which food waste occurs. It can be potentially used as a cost-effective method to substitute physical home visits of the researcher. In the second question he or she was asked to explain due to which factors the food waste had occurred. In a third question the respondent was asked to describe his or her feelings and/or emotions in this situation. In a fourth question the respondent was asked to describe what he or she needs to reduce or avoid food waste in a similar situation in the future. In a fifth question the respondent was asked to tick a checkbox whether he or she wastes food mainly because of: A) too little time, B) too little attention, C) or other. Ticking C) allowed the respondent to provide a self-defined response. In a sixth question the respondent was provided with a seven-point likert scale whether he or she completely agrees/disagrees to view himself or herself as a conscious person with a sustainable lifestyle. In a seventh question the respondent was asked to provide his or her birthday year. In an eighth question he or she was asked to provide his or her zip code. In a ninth question the respondent was asked to tick a checkbox on sex: A) Male, B) Female. In a tenth question he or she was asked to enter an ordinal number corresponding to the number of people that he or she shares the kitchen with. A help text informed the respondent to enter the value of '0' if he or she does not share the kitchen with anyone. In the eleventh and last

question the respondent was asked to fill in his or her email address if he or she wants to be contacted for further follow-ups on this research.

Second, I did not introduce a minimum word count and kept the *length* of the questions concise to increase the likelihood that respondents will complete it. The shortest question included 14 characters (including spaces), the longest 193 characters.

Third, I ran a small scale *pilot study* with five person to ensure that people understand the questions. The five person were selected by myself and included colleagues from my study programme 'Sustainable Development', my supervisor and people at a coworking space in Utrecht.

Fourth, I put easy questions first in the *question order* that asked people to merely describe a situation, followed by more difficult questions at the end, asking people to report on their emotions and feelings. I decided to put socio-demographical questions at the very end of the open-ended response.

Fifth, I avoided any technical jargon in the used *terminology*. I decided to not give any definition of the three concepts used which were: 1) food waste, 2) conscious self, 3) sustainable lifestyle. Instead the interpretation of these concepts was subject to the respondent.

Last, concerning the *presentation* of the online survey I used the online survey tool 'Typeform' that follows responsive web design [55] guidelines to provide an enhanced user experience while filling in the survey across different devices. Clear and concise instructions of 1,035 characters length (including spaces) were provided at the beginning of the online open-ended response to inform the respondent that he or she can upload a photo describing a particular situation of home food waste. Moreover the introduction included a key research question ("Hoe is voedselverspilling precies gerelateerd aan ons dagelijks leven?"), informed

the respondent about the estimated time needed to complete the open-ended response (five minutes), the public availability of the results, my email contact information and explained that respondents can submit multiple situations. A closing text of 187 characters length (including spaces) informed the respondent about the possibility to share the open-ended response through social media networks. Sharing options included Facebook, Twitter, LinkedIn, Google+, and BufferApp.

I disseminated the questionnaire through social media, the networks of Dutch organisations that work on food-related topics (e.g. Voedingscentrum, Milieucentraal), and in a physical coworking space in Utrecht. The collected sample is not representative of the Dutch population for several reasons. First, my own social media is largely comprised of young individuals (students) with a shared interest in sustainability. Second, the individuals reached through the Dutch organisations are likely to attract responses from a set of people with a similar mindset and potentially same age group. Third, the individuals reached in the coworking space are all self-employed freelancers. However, taking together these three groups, they provide a good insight into the struggles and hurdles of different groups of people to negotiate their day to day life and the occurrence of food waste.

I analysed the questionnaire responses with the open-source web software CATMA to code the content of the responses based on the theoretical scheme proposed in Section 5.

9. Results

Proposal Of A Theoretical Scheme For Household Food Waste And Everyday Life

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“als ik voedselverspil baal ik hier enorm van en het maakt dat ik extra alert ben op wat ik in huis heb en hoe ik dit op kan maken”

“I enormously hate to waste food and it makes me extra alert of the things I have at home and how I can best use them. ”

Written by a 32 years old woman who shares her kitchen with nobody else.

In response to my first research question—How do food-related practices affect the over-provisioning of food and avoidable household food waste in the homes of people?—I used both sources of Evans (2011, 2012) to construct a theoretical scheme that helps to explain the occurrence of household food waste from the lense of everyday life contingencies. This perspective allows for a richer understanding of the dynamics that occur on a household level and how these result in the occurrence of household food waste.

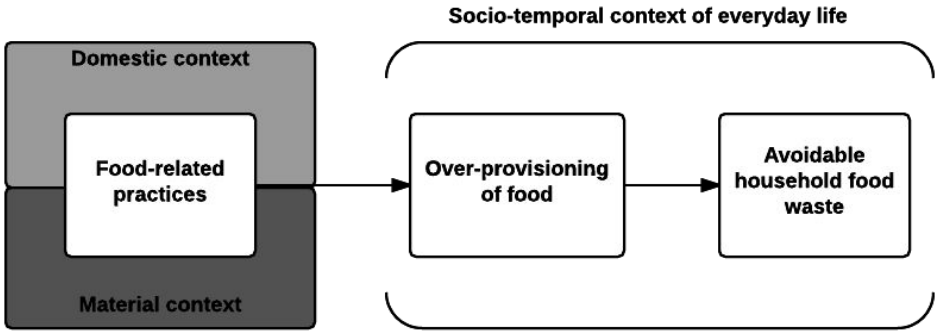

Figure 7: Conceptual framework on the relationship between food-related practices, food over-provisioning, and avoidable food waste at home. Adapted from Evans [40,49].

The scheme is interpreted as follows. A household constitutes of individuals who perform food-related practices, such as cooking, purchasing food, and eating. These practices are of a unique set and differ from household to household as each household is embedded in a specific domestic and material context.

The domestic context refers to factors that characterise the household, such as aspects of time (e.g. how much time is spent for the practice of eating), tastes (e.g. what are the food preferences of individuals), conventions (e.g. the rules and guidelines of doing certain things at home in a certain way), family relations (e.g.

how do people live together) and domestic divisions of labour (e.g. how is responsibility for the kitchen shared among the household members).

The material context refers to factors that influence the condition of the food in the household, such as domestic technologies (e.g. ownership of a refrigerator, freezer, or microwave), infrastructures of provision (how food is supplied to the household), and the materiality properties of food (e.g. specific characteristics inherent to the food).

The way individuals in households perform the abovementioned food-related practices, while being embedded in a specific domestic and material context, leads to the routinised over-provisioning of food [40].

What follows is a temporal passage that transforms ‘good’ food into ‘bad’ waste. This passage is created through the embeddedness of households into a particular socio-temporal context of everyday life, which again, is unique to each household. This socio-temporal context is best described as disruptions caused by the contingencies of everyday life that distort household provisioning routines and make it thus difficult for individuals to prevent the food from transforming into waste due to its material properties of natural decay. This highlights the importance to appreciate how food becomes waste through everyday practices [56].

10. Results

Applying A Systemic Level Perspective In The 100-100-100 Experiment

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“Ik voel me altijd schuldig als ik eten weg gooi en ben me er erg bewust van.”

“I feel always guilty when I waste food and I am very aware of it.”

Written by a 24 years old woman who shares her kitchen with one more person.

In this section I present the main highlights of the 100-100-100 experiment with respect to my research focus on household food waste. I omit other results that consider aspects of residual waste sorting and reductions in more general. The results presented in the below tables summarise the identified commonalities and disparities between two of the six households clusters that were used in the 100-100-100 experiment. I decided to only look at these two clusters as these two were the only clusters for which both residual and GFT food waste data was available from the compositional waste analysis. Thus I could only gain a complete picture on food waste occurrences within two weeks of these households' lives for these two clusters.

All tables present the findings categorised along the systemic level perspective framework introduced in Section. I will start to describe my findings in a reversed order, starting at the bottom of the framework with the amount of avoidable food waste found for both household clusters, and subsequently navigate my way up to influences and describe commonalities and disparities along the lines of the questionnaire results. In the table commonalities are highlighted with light grey background colour, disparities are highlighted with a dark grey background colour.

The first paragraph shows the results of the amount of avoidable food waste. If extrapolated to the total amount of avoidable food waste in kilograms per capita per year, cluster 2D produced 1.43 kilograms more than cluster 2B. There are noticeable disparities in the composition of the waste. Cluster 2D disposes less food waste in the residual waste stream. The share of food waste found in the residual stream of cluster 2D is 5 percentage points smaller than of cluster 2B. Cluster 2D, however, disposes more food waste in the GFT fraction.

The share of bread and uncooked leftovers was two percentage points higher in cluster 2D than in cluster 2B.

Table 6: Commonalities and disparities with respect to avoidable food waste in cluster 2B and 2D.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Amount of Avoidable household Food waste	GFT	kg/capita/2wk	EURECO	Numeric	-		0.20	0.31	0.12	A commonality was found for the share of cooked leftovers of the total GFT fraction. The largest disparity was found for the amount of total avoidable food waste which was higher in cluster 2D. Morever, cluster 2D tends to dispose more food waste found in the GFT fraction. Cluster 2B tends to dispose more food waste in the residual fraction.
		% bread					1%	3%	2%	
		% uncooked leftovers					2%	4%	2%	
		% cooked leftovers					4%	4%	0%	
	Residual	Food waste kg/capita/2wk					0.10	0.03	0.06	
		% Food waste					7%	2%	5%	
	Total	Avoidable food waste kg/capita/2wk					0.29	0.35		
		Avoidable food waste kg/capita/year					7.58	9.01	1.43	

The next paragraph discusses the commonalities and disparities found for both clusters regarding the influence of the retail supply chain on household food waste through retail, product, and packaging characteristics. Noticeably, cluster 2B expresses a higher agreement to the influence of all characteristics of the retail supply chain to the amount of avoidable food waste produced at home. The largest commonality was found for one product and packaging related characteristic. Both clusters largely disagree that the quality of the purchased products needs to increase in order to reduce one's food waste at home. One disparity was found for another product and packaging related characteristic. Cluster 2B tends to agree that they would waste less food if they have more information about how to use product leftovers. Cluster 2D shows a moderate disagreement. Further disparities were found for all three retail-related characteristics.

Cluster 2D shows normal to strong disagreement that, in order to reduce food waste, shopping needs to be done further away from home, or at another supermarket. Moreover, cluster 2D disagrees more strongly than cluster 2B that more storage space at home is needed to reduce food waste.

Table 7: Commonalities and disparities of cluster 2B and 2D with respect to retail supply chain influences.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Retail Supply Chain	Product & packaging	I will waste less food if the quality of the purchased products increases*	Q2 (n=6,10)	Completely disagree (1) – completely agree (7)	2	0.74	2.33	2.00	0.33	The largest commonality was found for large disagreement that one will reduce food waste if the quality of the purchased products increases. The largest disparity was found in a high agreement of cluster 2B that one will reduce food waste if one has more information what to do with leftovers, in comparison to a disagreement in cluster 2D
		I will waste less food if products have a longer shelf life*				0.79	3.00	1.83	1.17	
		I will waste less food if I have more information what to do with leftovers*				0.63	5.17	3.17	2.00	
		I will waste less food if packaging keeps the products longer fresh*				0.82	4.33	3.50	0.83	
	Retail	If I want to reduce food waste, I need to do my shopping further away from home*	Q2 (n=6,10)	Completely disagree (1) – completely agree (7)	5	0.85	4.3	2.7	1.67	Large disparities were found in all retail-related variables. Cluster 2D disagrees that if one wants to reduce food waste, shopping needs to be done further away from home, more storage space is required at home, and shopping needs to be done at another supermarket
		If I want to reduce food waste, I need more storage space at home*				0.55	3.0	1.3	1.67	
		If I want to reduce food waste, I need to do my shopping at another supermarket*				0.85	4.8	1.3	3.50	

The next paragraph looks at behaviours that influence food waste as one aspect of individuals and households' characteristics. A large disparity was found for the willingness to share food leftovers, e.g. with neighbours to reduce the amount of food waste produced at home. Cluster 2D shows a stronger willingness whereas cluster 2B tends to disagree to share personal food leftovers. Another disparity was found in the frequency in which food is disposed. Cluster 2B shows a higher frequency than 2D in the category of throwing away food 8 to 10 times per week.

Table 8: Commonalities and disparities of cluster 2B and 2D with respect to behaviours that influence food waste.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Individuals and households	Behaviours that influence food waste	% throwing away food 0-3 times per week	Q1 (n=8,13)	Numeric	-		63%	67%	4%	
		% throwing away food 4-7 times per week					25%	33%	8%	
		% throwing away food 8-10 times per week					13%	0%	13%	The largest disparity was found for a high willingness to share food leftovers in cluster 2D in comparison to a moderate willingness in 2B
		Willingness to share food leftovers		y disagree (1) – completel y agree (7)			3.50	5.00	1.5	
		I throw away food that has passed the expiry date[2]	Q2 (n=6,10)	Never (1) – always (7)	2	0.89	3.38	3.69	0.32	
		I throw away food if I had cooked/bought too much[2]			2	0.81	3.38	2.92	0.45	

The next paragraph looks at the facilities and resources accessible to individuals and households of both clusters. We asked households to report whether they own a fridge-freezer combination, a sole fridge, or a freezer. A commonality was found that none of the households in both clusters owned a freezer to preserve leftovers for a longer period. Disparities were found for the endowment of fridge-freezer combinations and sole fridges. Cluster 2B tends to have more combined appliances whereas cluster 2D tends to own more sole refrigerators.

Table 9: Commonalities and disparities of cluster 2B and 2D with respect to owned facilities and resources.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Individuals And households	Facilities & resources	% owning refrigerator-freezer combination	Q1 (n=8,13)	Numeric	-		63%	38%	24%	The largest commonality was found that none of the households had a separate freezer to potentially store leftovers. The largest disparity was found for a larger endowment of cluster 2B with refrigerator-freezer combinations in comparison to a smaller endowment in cluster 2D
		% owning refrigerator					38%	62%	24%	
		% owning freezer					0%	0%	0%	

This paragraph shows the results for the individual awareness of the issue of waste sorting. Herein I take waste sorting as a proxy for the awareness of waste issues, which includes food waste. I assume that awareness for waste sorting correlate with the awareness for food waste, i.e. if an individual's awareness for the importance of waste sorting increases, it is also likely to increase his or her awareness for the importance of reducing food waste. The largest commonality between both clusters was found for the statement that proper waste sorting saves the environment. Both clusters agree to a large degree to this statement. The largest disparity between both clusters was found for the statement that proper waste sorting saves money. Cluster 2D tends to agree to a large extent whereas 2B tends to agree to a little extent.

Table 10: Commonalities and disparities for cluster 2B and 2D with respect to the awareness of proper waste sorting.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Individuals and households	Awareness Of the issue	Proper waste sorting saves money	Q1 (n=8,13)	Very little (1) – Very much (7)	1	0.57	3.75	5.46	1.71	The largest commonality was found in a high awareness that proper waste sorting reduces environmental impacts. The largest disparity was found in a low awareness of cluster 2B in comparison to a high awareness of cluster 2D that proper waste sorting leads to financial savings
		Proper waste sorting saves the environment				0.91	6.25	6.31	0.06	
		Proper waste sorting saves raw materials				0.88	6.00	6.31	0.31	
		Proper waste sorting increases filth			2	0.83	2.38	1.85	0.53	
		Proper waste sorting reduces comfort				0.82	3.50	3.00	0.50	

This paragraph shows the results for the knowledge and skills related to behaviours. Both clusters were asked to indicate whether they will waste less food if product packaging provides information how how to best preserve food. A commonality was found in that both clusters do not express a clear opinion whether or not this information would reduce household food waste.

Table 11: Commonalities and disparities of cluster 2B and 2D with respect to knowledge and skills on leftover reuse.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Individuals And households	Knowledge & skills Related to behaviour	I will waste less food if packaging provides information how to best preserve food	Q2 (n=6,10)	Completely disagree (1) – completely agree (7)	-	-	4.33	4.33	0	A commonality was found regarding the moderate agreeing that one would waste less food if packaging provides information on how to best store food

The next paragraph shows the results for perceived social norms of both clusters. No clear disparities were found between both clusters. Two commonalities were found for the perception how often other people important in the lives of the respondents, particularly family and friends, properly sort their waste. Both clusters agreed that friends and family members perform proper waste sorting behaviour regularly. This strong expression of perceived social norms with respect

to waste-related behaviour is a positive finding. Other studies found that the prevention of food waste has less 'visibility' to other people and peers than other pro-environmental behaviours, and that social norms around 'waste' therefore play a reduced role compared to more visible activities [45].

Table 12: Commonalities and disparities of cluster 2B and 2B with respect to perceived social norms on waste sorting.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Individuals and households	Perceived social norms	Perception how often other people sort properly waste	Q1 (n=8,13)	Never (1) – always (7)	2	0.69	4.38	4.62	0.24	No clear disparity was identified. The largest commonalities were found for the perceived frequency of proper waste sorting of other people important in one's life, such as family members and friends
		Perception how often other people important for one's life properly sort waste				0.88	4.75	4.85	0.10	
		Perception how often friends and family members properly sort waste				0.86	4.88	4.85	0.03	
		Perception that important people in one's life expect to properly sort waste				0.94	5.13	4.46	0.66	
		Perception that friends and family members expect from oneself to properly sort waste		Completely disagree (1) – completely agree (7)	1	0.93	5.25	4.46	0.79	
		Perception that other people expect from oneself to properly sort waste				0.9	4.63	4.15	0.47	

The next paragraph shows the results for commonalities and disparities of habits performed in the realm of the household. A commonality was found for the large degree to which both clusters properly sort their glass waste. Large disparities were, however, found for other waste streams. Cluster 2B tends to properly sort less textile, cooking oil, electrical appliances, and hazardous waste. With regard to GFT, the fraction potentially most interesting for food waste sorting, both clusters report a very high proper sorting rate. Therein 2B performs slightly better than cluster 2D.

Table 13: Commonalities and disparities of cluster 2B and 2D with respect to habits related to environmental behaviours.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation Component	Value	2B	2D	ABS(Δ)	Commonalities / disparities
Individuals and households	Habits	While shopping, I use my own bag[2]	Q1 (n=8,13)	Never (1) – always (7)	1	0.6	5.63	6.46	0.84	A commonality was found for the high degree of proper glass separation. The largest disparities were found for the degree of proper separation of textile, cooking oil, electrical appliances, and hazardous waste
		While shopping, I avoid unnecessary packaging[2]				0.7	2.75	3.77	1.02	
		I prevent old paper[2]				0.59	3.25	4.62	1.37	
		I reduce my waste[2]				0.73	4.50	4.92	0.42	
		I support policy that supports pro-environmental behaviour[2]				0.82	4.63	6.00	1.38	
		Degree of properly sorting glass		Nothing (1) – everything (8)	-		7.88	7.92	0.05	
		Degree of properly sorting paper & cardboard					7.88	7.69	0.18	
		Degree of properly sorting plastic & plastic packaging					7.13	7.62	0.49	
		Degree of properly sorting GFT					7.88	7.23	0.64	
		Degree of properly sorting textile					3.38	6.31	2.93	
		Degree of properly sorting cooking oil					2.63	5.85	3.22	
		Degree of properly sorting electrical appliances					1.88	6.23	4.36	
		Degree of properly sorting hazardous waste					3.50	6.08	2.58	
		Average number of residual waste bags offered past month		Numeric			2.63	1.69	0.93	

The next paragraph shows the results for motivational commonalities and disparities. A commonality was found in the motivation to reduce waste. Both household clusters tend to agree that it is feasible to reduce waste. A disparity was found for the support of pro-environmental policy. Cluster 2D tends to agree more that it is feasible for these households to support pro-environmental policy.

Table 14: Commonalities and disparities of cluster 2B and 2D with respect to motivation to perform pro-environmental behaviour.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Individuals And households	Motivation	It costs me very little effort to reduce waste	Q1 (n=8,13)	Completely disagree (1) – completely agree (7)	2	0.71	3.25	3.85	0.60	A commonality was found for the perceived feasibility to reduce one's own waste. Both clusters tend to agree that reducing waste is feasible. The largest disparity was found with regard to supporting pro-environmental policy. Household cluster 2D tends to highly agree that they can express their support in comparison to a moderate expression of cluster 2B
		It is feasible for me to reduce waste				0.91	4.50	4.62	0.12	
		I can reduce waste				0.87	4.88	4.85	0.03	
		It costs me very little effort to support pro-environmental policy				0.89	4.50	5.15	0.65	
		It is feasible for me to support pro-environmental policy			1	0.93	4.50	5.46	0.96	
		I can support support pro-environmental policy				0.92	4.50	5.46	0.96	

In the next paragraph results are shown for attitudinal commonalities and disparities. No clear commonality was found between both clusters. The largest disparity was found with respect to acting pro-environmentally. Cluster 2D tends to agree more strongly that they perceive themselves as the type of person that acts pro-environmentally whereas cluster 2B tends to be indifferent.

Table 15: Commonalities and disparities found for cluster 2B and 2D with respect to environmental attitudes.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Individuals and households	Attitudes	It gives me a good feeling trying my best to properly sort waste[1]	Q1 (n=8,13)	Completely disagree (1) – completely agree (7)	2	0.55	5.88	6.38	0.51	No clear commonality could be identified. The largest disparity was found for identifying with an environmental self-identity. Household cluster 2D shows a high agreement in comparison to a moderate agreement of cluster 2B
		I am the type of person that acts pro-environmentally[1]				0.87	4.25	5.38	1.13	
		I can contribute to reducing environmental impacts by properly sorting waste[1]				0.88	4.50	5.15	0.65	
		The quality of the environment will improve if I properly sort waste[1]				0.86	4.63	5.08	0.45	

The next paragraph presents the commonalities and disparities between both clusters with respect to environmental beliefs. The largest commonality found between both groups was the agreed concern about the depletion of raw materials

caused by improper waste separation. The largest disparity was found for the extent to which environmental practices are an important part of the respondents. Individuals of cluster 2D tend to strongly agree about the importance, with a less stronger agreement found for cluster 2B.

Table 16: Commonalities and disparities found for cluster 2B and 2D with respect to environmental beliefs.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Individuals and households	Beliefs	Environmental practices are an important part of who I am[1]	Q1 (n=8,13)	Completely disagree (1) – completely agree (7)	1	0.85	5.38	6.46	1.09	The largest commonality included a moderate concern about the depletion of raw materials caused by improper waste separation. The largest disparity was found for the degree to which environmental practices are an important part of oneself. Household cluster 2D expresses a higher importance
		I think that not sorting waste properly leads to serious environmental impacts[1]				0.78	5.63	5.92	0.30	
		I can contribute to reducing the depletion of raw materials by properly sorting waste[1]				0.72	5.00	5.54	0.54	
		It is against my principles to offer waste without proper sorting [1]				0.56	5.63	6.38	0.76	
		I feel a moral obligation to properly sort waste[1]				0.66	5.75	6.08	0.33	
		I am worried about depletion of raw materials caused by improper waste separation[1]			3	0.83	4.75	4.85	0.10	
		I am worried about the depletion of raw materials[1]				0.86	4.75	5.54	0.79	

The next paragraph shows the results for commonalities and disparities of both clusters found in the expression of different value sets. The largest commonality was found for the high importance of the biospheric value to prevent environmental pollution. The largest disparity was found for the hedonic value to pamper oneself. Cluster 2B shows a strong importance for self-pampering whereas cluster 2D finds it of less importance.

Table 17: Commonalities and disparities found for cluster 2B and 2D with respect to different value types.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Individuals and households	Values	respect for the earth	Q1 (n=8,13)	Against my principles (1) – of extreme importance (9)	1	0.72	7.38	7.23	0.14	The largest commonality was found for a high importance to prevent environmental pollution. A large disparity was found for the value to pamper oneself which was high for cluster 2B but moderate for 2D
		unity with nature				0.81	7.00	6.62	0.38	
		environmental protection				0.82	7.38	7.15	0.22	
		Prevent environmental pollution				0.75	7.00	7.08	0.08	
		power			2	0.73	2.88	2.38	0.49	
		wealth				0.69	4.75	3.62	1.13	
		authority				0.83	3.75	3.00	0.75	
		influential				0.73	4.50	4.92	0.42	
		ambitious				0.57	5.50	5.23	0.27	
		pleasure				0.82	5.75	6.15	0.40	
		enjoying			3	0.81	7.38	6.77	0.61	
		pamper yourself				0.83	6.88	5.46	1.41	
		equality			4	0.67	6.75	7.08	0.33	
		peaceful world				0.58	7.25	7.38	0.13	
		social justice				0.80	6.88	7.08	0.20	
		helpful				0.70	6.38	7.15	0.78	

In the next paragraph the commonalities and disparities are shown for the household composition of both clusters. About 15 percent of both clusters live alone with their partner. Cluster 2B was comprised of more single households, 38% percent indicated to live alone in comparison to only 15 percent in cluster 2D. Cluster 2D consisted of more family households with children. The average household size was 1.1. person larger in cluster 2D than 2B.

Table 18: Commonalities and disparities found for cluster 2B and 2D with respect to household composition.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Influences	Household Composition	Total number of individuals	Q1 (n=8,13)	-	-	-	22	46	24	Several disparities were found between the clusters. Household cluster 2D consisted of more family households, household cluster 2B of more single households. A commonality was found for a comparable share of households living with their partner
		Average household size					2.4	3.5	1.1	
		Total number of households					9	13	4	
		% single					38%	15%	22%	
		% with partner					13%	15%	3%	
		% with partner and children					50%	69%	19%	

The next paragraph looks at the commonalities and disparities with respect to socio-demographics of both household clusters. The largest commonality was found for housing situation and monthly income level. Both household clusters predominantly live in low-rise buildings with an attached garden. With respect to the monthly income of the respondent, none of the respondents falls into the income category of 1.000 to 1.350 euro. The largest disparity was found in the sex of the questionnaire respondent. Cluster 2B had an equal share of male and female respondents whereas for cluster 2D the large majority of the respondents were female.

Table 19: Commonalities and disparities found for cluster 2B and 2D with respect to socio-demographic variables.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Influences	Socio-demographics	Average age of respondent	Q1 (n=8,13)	-			51	46	5	The largest commonality is found for housing situation and income level. Both household clusters tend to live in low-rise with a garden and do not represent the income class 1.000€ < 1.350€. The largest disparity is found for the sex of the respondent of the questionnaire, potentially indicating the sex responsible for the kitchen. Household cluster 2B consisted of an equal share between male and female
		% male respondents					50%	23%	27%	
		% female respondents					50%	77%	27%	
		% apartment, high-rise					13%	0%	13%	
		% low-rise with garden					88%	100%	13%	
		% low-rise no garden					0%	0%	0%	
		% monthly income < 1.000€					13%	8%	5%	
		% 1.000€ < monthly income < 1.350€					0%	0%	0%	
		% 1.350€ < monthly income < 1.800€					0%	8%	8%	
		% 1.800€ < monthly income < 3.150€					50%	46%	4%	
		% monthly income > 3.150€					13%	31%	18%	
		% don't know / don't want to tell monthly income					25%	8%	17%	
		Lower vocational education (secondary school, VMBO, VBO, LEAO, MAVO)					25%	15%	10%	
		Secondary vocational education					25%	31%	6%	
		Higher professional education					50%	38%	12%	
		Scientific education					0%	15%	15%	

In the next paragraph the commonalities and disparities are shown with respect to economic influences. The largest commonality between both clusters was found for the economic costs of time. Both clusters tend to be indifferent whether or not reducing food waste costs oneself more time. The largest disparity was found for the influence of food prices. Both clusters tend to disagree with the statement that they would waste less food if food prices were higher. However, cluster 2B tends to disagree less strongly than cluster 2D. A noticeable difference is the economic influence induced by differentiated tariffs in the waste collection system to which household cluster 2D was exposed to. Differentiated tariffs increase the costs for improperly sorted waste for the household and thus incentivise households to properly sort waste.

Table 20: Commonalities and disparities of cluster 2B and 2D with respect to economic influences.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Influences	Economic	Differentiated tariffs Reversed collection	ROVA		-		no Phase 2	yes Phase 2	-	
		If I want to reduce food waste, I need to manage my meals more flexibly*	Q2 (n=6,10)	Completely disagree (1) – completely agree (7)	4	0.86	5.33	6.00	0.67	The largest commonality is found for an average agreement that reducing food waste costs oneself more time. The largest disparity is found for whether or not the households will waste less food if food is more expensive. Households of cluster 2D tend to disagree more
		If I want to reduce food waste, it costs me more time*				0.58	3.50	3.67	0.17	
		I will waste less food if food is more expensive*				0.69	2.83	1.17	1.67	
		I will waste less food if supermarkets offer less promotional and advertised products*				0.54	2.50	2.17	0.33	
		I will waste less food if I am solely responsible for the food in my household*			3	0.58	4.17	3.00	1.17	
		I will waste less food if I have to pay for my collected GFT waste*				0.74	2.83	1.83	1.00	

The last paragraph presents the results of cultural influences. The largest commonality between both clusters was found for a strong disagreement of both household clusters that reducing food waste leads to less variety in the food provided to family and guests. The largest disparity was found a stronger disagreement of cluster 2D with regard to the statement that in order to reduce food waste one can purchase less products on promotion.

Table 21: Commonalities and disparities of cluster 2B and 2D with respect to cultural influences.

Framework Component	Sub-Component	Variable	Source	Scale	Principal component analysis Eigenvalues over 1 times the mean eigenvalue, Max. iterations for Convergence=25, Varimax Rotation		2B	2D	ABS(Δ)	Commonalities / disparities
					Component	Value				
Influences	Cultural	If I want to reduce food waste, I do not have enough food for my family and guests*	Q2 (n=6,10)	Completely disagree (1) – completely agree (7)	1	0.82	2.17	1.33	0.83	Both household clusters agree that reducing household food waste does not need to lead to less variety in the food provided for family and guests. The largest disparity between both clusters concerns whether or not households need to purchase less promoted products in order to reduce food waste
		If I want to reduce food waste, I have less variety in the food for my family and guests*				0.84	1.67	1.67	0	
		If I want to reduce food waste, I can buy less products on promotion*				0.53	3.50	2.17	1.33	
		If I want to reduce food waste, it costs me more money*				0.69	2.50	1.50	1	

11. Discussion

A Critical Perspective On The Results Of The 100-100-100 Experiment

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“Zonde om weg te gooien, maar ik vind het niet meer lekker om op te eten, liever weer lekker vers brood.”

“Sinful to waste it, but I don’t find it tasty anymore to eat it. Better fresh bread again.”

Written by a 25 years old woman who shares her kitchen with eight people.

In the previous section I presented a selection of the collected data from the 100-100-100 experiment, applying the lense of the systemic level perspective discussed in Section 5 on the theoretical framework. In this section I will discuss the results and demonstrate the linkage to my further research in the subsequent sections of this thesis that I had carried out after having derived these preliminary conclusions.

To begin with, both household clusters 2B and 2D have achieved a remarkable low production of household food waste. In comparison to national averages, these households waste about 70 percent less food. Moreover, their awareness for waste sorting is higher and less food waste was found in the residual stream in comparison to national averages. In this discussion section I want to explore potential explanations as to why these households waste so little food.

Following the previously used perspective of the 'spaghetti' framework, I begin to discuss cultural influences. Previous studies on household food waste had looked at the importance of the 'good provider' identity [19,57]. The good provider identity refers to people's desire to be a good host for family members, friends, and guests by serving healthy, tasty food in sufficient quantities. The importance of this identity for people was shown by Graham-Rowe et al. [58], for instance, who had identified the good provider as one of four core barriers that prevents UK households from minimising food waste. In the household clusters of the 100-100-100 experiment, the people's desire of being a good provider seemed to be much less threatened by the act of reducing food waste[9].

A noteworthy aspect for discussion are the economic costs of time and money, and the division of home labour. The clusters disagree that reducing food

[9] See variable 1 and 2 in cultural influences.

waste leads to increased costs[10]. This is potentially connected to their agreement that purchasing promoted products and attempting to reduce food waste do not need to be mutually exclusive.[11] Similarly they disagree that supermarkets need to offer less promotional products to reduce food waste at home. This might suggest that these households have found ways to integrate short-life promoted products effortlessly into their day to day life that does not leave them with leftovers of these products. This is supported by the disagreement to the statement that reducing food waste costs more time.[12] However, the households do agree that they need to manage their meals more flexibly to reduce food waste, which shows a certain awareness and practical experience with negotiating the contingencies of everyday life. They also disagree that they would waste less food if food was more expensive. [13] This needs to be interpreted, however, in the light of the well-situated background of the households which stem from higher income categories.[14]

An interesting aspect to look at is the influence of waste infrastructure on household food waste generation and sorting behaviour. Previous studies looked both at the role of infrastructure in the home, such as the agency of bins, and the influence of waste infrastructure on convenience, but also outside the home, for instance through differentiated tariff schemes or separate organic (GFT) collection systems. The households in our study were all exposed to a reversed collection system (phase 2), increasing convenience for proper waste sorting and decreasing convenience for residual waste production. Moreover, cluster 2D was exposed to

[10] See variable 4 in cultural influences.

[11] See variable 3 in cultural influences.

[12] See variable 4 in economic influences.

[13] See variable 4 in economic influences.

[14] See variables 6-10 in socio-demographics.

differentiated tariffs (DifTar) scheme. These two together raise the financial incentive as well as increase the perceived ease to dispose cutting waste in the designated GFT stream more for the cluster 2D than for 2B. Indeed, this can be seen back in the share of food waste disposed in the residual waste stream which is 5 percentage points lower for cluster 2D than for 2B.[15] This might also explain why cluster 2D disagrees more strongly that paying for GFT waste would lead to less food waste since cluster 2D is already exposed to a differentiated tariffs scheme.

A special discussion point concerns the participating households. The participating households of both clusters enrolled through a self-selection process. Therefore the experiment provided an inherent self-selection bias due to the inclusion of households with a more intrinsic motivation to challenge themselves to reduce waste, stemming from a well-educated background and higher income categories. Therefore the achieved results are not representative but rather need to be seen as a showcase of what levels of food waste are practically achievable in the day to day life of people. Despite this limitation, the results are worth comparing to other studies that looked at Dutch households [20,36]. Similarly, these studies mostly looked at households living in low-rise buildings, with separate groente-, fruit- en tuinafval (GFT) collection and mini-containers, but without a DifTar[16] scheme. In our study, household cluster 2D was exposed to a DifTar scheme which could have contributed to the lower share of food waste found in the residual stream, compared to cluster 2B without DifTar. I summarised my findings in the figure below, applying the systemic level perspective.

[15] See variable 6 in amount of avoidable household food waste.

[16] DifTar is a differentiated tariff scheme based on the polluter pays principle from economics. Households' subjected tariff is based on the amount of produced waste (m3 or kg).

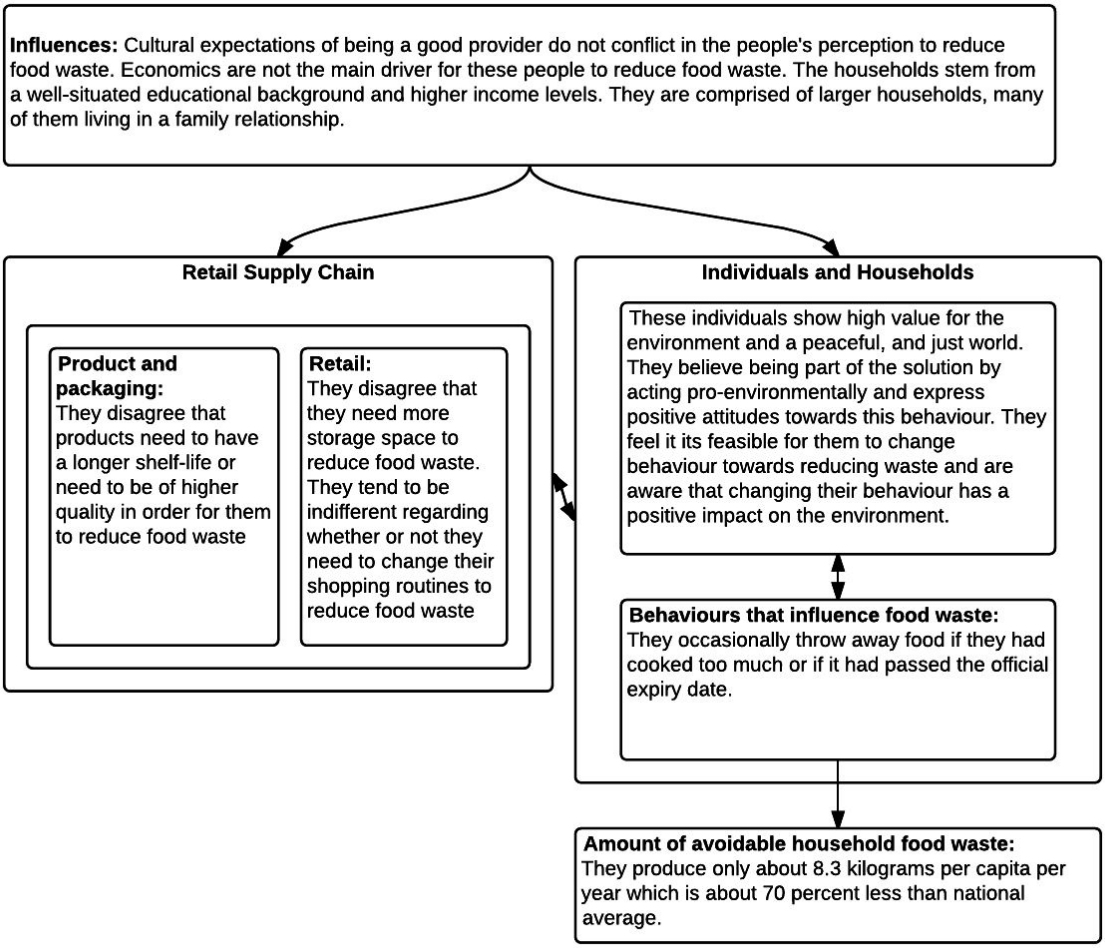

Figure 8: Summarised results of the 100-100-100 experiment applying the conceptual framework of Quested et al. [45]**.**

In the light of the results and points for discussion, I want to highlight some important caveats and limitations of this study. First, the analysed waste covered only two weeks. It therefore does not take into account temporal variation, particularly of seasons with numerous festive events (Christmas time). Second, it is possible that households might have achieved these low levels of food waste through an initially high ambition by participating in the study. This might also help to explain why food waste after the intervention increased to 11.12 kilograms in cluster 2B (7.58 kilograms prior to intervention) and to 13.15 kilograms in cluster

2D (9.01 kilograms prior to intervention). Lastly, and certainly the strongest limitation to draw strong conclusions, both clusters were comprised of only a few households. Cluster 2B consisted of 9 households, of which 1 households did not fill in questionnaire 1, and three that did not fill in questionnaire 2.

From the 100-100-100 study I conclude that households have a large potential to reduce food waste at home and that societal influences and the retail supply chain characteristics, as pictured by Quested et al. [45], do not necessarily need to impede a significant achievable reduction by households. On the contrary, as shown in this study, households with a strong expression of societal and biospheric values, a motivation for pro-environmental behaviour, strong perceived social norms around pro-environmental behaviour, and a general awareness of the environmental impacts of 'wasteful' behaviour can lead to significant reductions of up 70 percent. This echoes with another study that found that environmentally educated households wasted less, particularly less prepared food [59]. Moreover, they found that these households also wasted less due to passed best before date. Generally these households were more observant to packaging aspects in relation to food waste but also wanted packaging to a lower extent.

The question I conclude this section with, why are these households so successful in reducing household food waste at home in comparison to other population groups?

12. Results

Open-Ended Responses Approach To Reveal Everyday Life

“Ik vond het wel zonde. Maar ik wist dat ik het niet ging opeten.”

“I found it indeed sinful. But I actually knew that I am not going to eat it.”

Written by a 30 years old woman who shares her kitchen with one person.

The results of the 100-100-100 experiment showed the potentials for achievable household food waste reductions, even without significant changes in larger systems that interact with the household level. The important question that I want to address in the subsequent sections is how people organise their everyday life and how this organisation of life leads to or prevents food waste in the home. As demonstrated by the 100-100-100, these households arguably have found ways to organise life as such that they manage to achieve levels of food waste supercede those by national averages by 70 percent.

Unfortunately, I did not manage to involve these particular households in a follow-up research to more clearly identify the success factors of these households arriving at such a low level of food waste. Therefore, my follow-up research with open-ended responses involved an entirely different set of individuals and households. The ways I invited people to participate in my research are outlined in Section 8 . In the next sections I will present the results of this follow-up research. First, I start with general metrics on the survey results. The questionnaire had 424 unique visits and 108 total responses (25 percent completion rate). The average time complete the questionnaire was 04:40 minutes. 63 percent of the responses came from PCs and laptops, 27 percent from smartphones and 10 percent from tablets. The highest completion rate was achieved on PCs and laptops (29 percent), followed by tablets (21 percent), and smartphones (18 percent).

The next sections present the results of the questionnaire. I split these into two parts. The first part presents the quantifiable parts of the questionnaire. The second part presents the results of the qualitative questions.

The first question concerned whether people waste food due to (1) a lack of attention, (2) a lack of time, or (3) other reasons. The majority of 59 percent of the

respondents say that they waste food due to a lack of attention. Only 17 percent of the respondents say that they waste due to a lack of time. 24 percent of the results have not been well-captured. These people say that they waste food for other reasons.

Figure 9: Reasons for respondents to waste food due to a lack of attention ("Te weinig aandacht"), a lack of time ("Te weinig tijd"), or other ("Anders").

The majority of 37 percent of the respondents see themselves as being a mostly conscious person with a sustainable lifestyle (Likert scale 5 out of 7). 35 percent agree to that statement very strongly. 12 percent completely agree with that statement. 10 percent are indifferent. An equal share of 3 percent disagree slightly and mostly disagree. The average likert score was 5.35 out of a maximum of 7. This high share of people with a sustainable lifestyle makes it more suitable to compare with the previous results of the 100-100-100 experiment which was also comprised of households with a strong environmental self-identity.

With respect to sex of the respondents, 64 percent were women, and 36 percent were men. The average age of the respondents was 34. On average, the respondents share their kitchen with 2.36 other people.

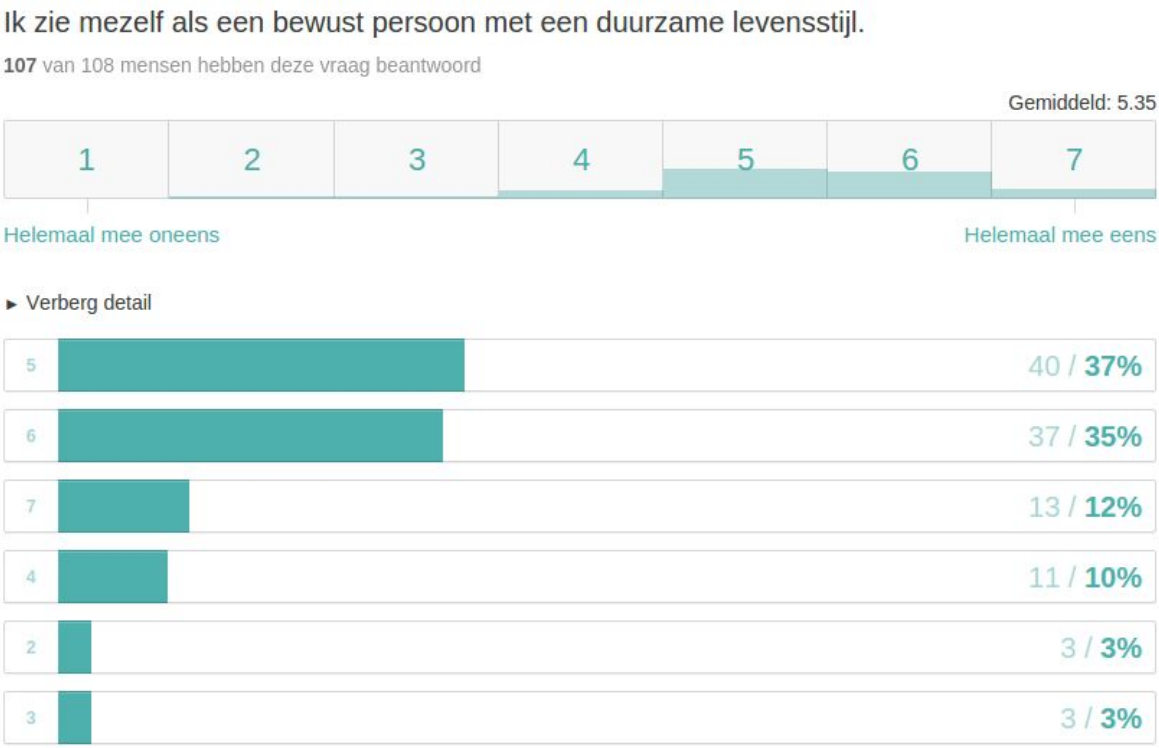

Figure 10: Responses with respect to the degree of seeing oneself as a conscious person with a sustainable lifestyle.

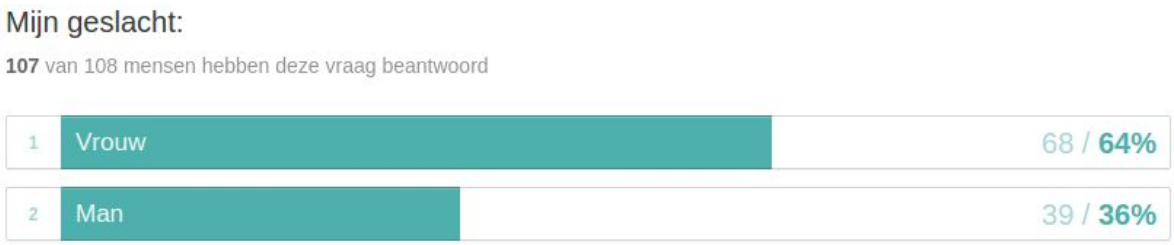

Figure 11: Sex distribution in the open-ended responses with 64 percent female ("Vrouw") and 36 percent male ("Man).

After these general results, I present the findings of the qualitative responses that referred to a specific situation of the past two weeks in which the respondents had experienced the occurrence of food waste at home. I show the results along my

proposed framework in Section 9.

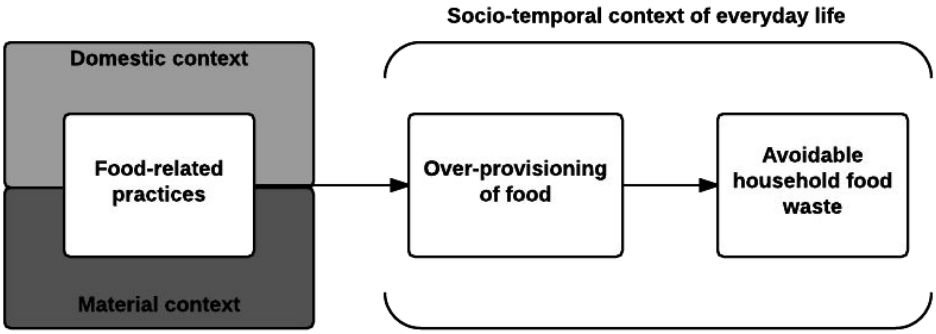

Figure 12: Conceptual framework on the relationship between food-related practices, food over-provisioning, and avoidable food waste at home. Adapted from Evans [40,49].

First, I present my findings for the material context. The material context was named 41 times in the open-ended responses. With 13 occasions (31 percent), the fridge was the most frequently named object of the material context. Freezer and bin followed with 5 occasions (12 percent). Animals and oversized packages followed with 3 occasions (7 percent).

CATMA Query Result

Tag Definition	Frequency	Visible in Kwic
/Material context/Freezer	5	false
/Material context/Bin	5	false
/Material context/Food-product-specific container	2	false
/Material context/Pan	1	false
/Material context/Animals	3	false
/Material context/Oversized package	3	false
/Material context/Organic product	1	false
/Material context/Fridge	13	false
/Material context/Product promotion	2	false
/Material context associated to home practices	1	false
/Material context/Packaging properties	1	false
/Material context/Local supply	2	false
/Material context/Changing home	2	false
Total	41	

Figure 13: CATMA query results for material context factors.

Second, I present my findings for the domestic context. I could identify 34 clear occasions in which respondents referred to a particular domestic context. With 6 occasions (18 percent), the family meal was the most frequent social event that the respondents referred to. This was followed by 4 festive events (9 percent), in particular reference to barbeques (BBQs), and 4 situations (9 percent) that refer to a meeting, appointment, or agreement between people.

CATMA Query Result

Tag Definition	Frequency	Visible in Kwic
/Domestic context/Single parent	1	false
/Domestic context/Seasons	2	false
/Domestic context/Meetings, appointments and agreements	4	false
/Domestic context/Holidays	2	false
/Domestic context/Not eaten at home	3	false
/Domestic context/Family meal	6	false
/Domestic context/BBQ and festive events	4	false
/Domestic context/Household members	3	false
/Domestic context/Holiday home	1	false
/Domestic context/Product ownership	1	false
/Domestic context/School	1	false
/Domestic context/Student housing	1	false
/Domestic context/Eating alone and single	2	false
/Domestic context associated to home practices	1	false
/Domestic context/External provision of food	1	false
/Domestic context/Guests	1	false
Total	34	

Figure 14: CATMA query results from domestic context factors.

13. Discussion

A Critical Perspective On The Results Of The Open-Ended Responses

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“Ik vond het erg vervelend. Zonde van de avocado's, helemaal uit Marokko hierheen gekomen.”

“I found it really annoying. What sinful of the avocados, came the entire way from Morocco to here.”

Written by a 30 years old woman who shares her kitchen with seven people.

In this section I will discuss the findings of the open-ended responses and provide more context to responses by referring to particular excerpts of the responses.

To begin with, the general problem of food overprovisioning as shown by Evans [40] was also visible in the collected responses, as the following cooking examples demonstrate:

R: Te grote porties gekookt. Verkeerde inschatting eetlust

T: Cooked to large portion. Wrongly estimated appetite

R: Teveel gekookt én heel erg niet lekker. Dus dan toch weg. Verkeerde inschatting van aantal mee-etende personen. (onnadenkend)

T: Cooked too much and absolutely not tasty. Thus better throwing away. Wrongly estimated number of person eating. (unthinking)

R: Doordat ik teveel gekookt heb.

T: Because I have cooked too much.

R: teveel gekookt. meestal komt dat ook doordat de porties in de supermarkt te groot zijn voor 1 persoon

T: Cooked too much. Mostly it also happens because the portions in the supermarket are too large for one person

The last example demonstrates the connectedness between the practice of cooking with the material context of provision. The respondent describes how the

portions are not made for single households. The respondent provides a noteworthy addition to describe the situation further:

R: avondeten gekookt wat teveel bleek te zijn voor mij alleen. ik eet het dan wel twee dagen maar de rest gaat meestal weg

T: cooked dinner which seemed to be too much for me alone. I then do eat it for two more days but the rest is mostly thrown away

The respondent seemed to have found a solution to reduce food waste by reusing the leftovers. Noteworthy, however, she does not address the problem by already portioning the purchased products while cooking.

Other situations demonstrate how people have difficulties to prepare food for a group of people:

R: Teveel gekookt. Het is evenveel moeite en kost evenveel geld om voor 4 personen te koken

T: Cooked too much. It costs the same amount of effort and money to cook for 4 person

Aside cooking, purchasing food is another food-related practice that frequently leads to over provisioning of food at home:

R: Over de datum producten. Te veel producten gekocht

T: Expired products. Bought too many products

R: teveel fruit in eens ingekocht en er niet voldoende van gegeten. […]

T: Bought too many fruits at once and did not eat enough of them. […]

R: teveel venkel gekocht en niet gebruikt waardoor ik deze kon weggoien omdat de venkel niet meer goed was

T: Bought too much fennel and didn't use it due to which I had to throw it away because the fennel was no longer good

The below examples demonstrate how people purchase food for which they did not foresee a concrete use at the point of purchase:

R: Gisteren heb ik een biologische bloemkool weggegooid. In de aanbieding gekocht en uiteindelijk, paar dagen niet thuis gegeten en ook geen trek in.

T: Yesterday, I threw away an organic cauliflower. Bought on discount and eventually not eaten at home for a couple of days and also no appetite for it.

R: een taartje dat in de bonus gekocht was, bleef te lang staan en is niet meer opgegeten.

T: a pie that was bought on discount was left for too long and is not eaten anymore.

These situations show the difficulty for people to resist the temptation of purchasing promotional products in the supermarket.

The first question I want to address is what are the material and domestic context factors that influence food-related practices. As shown by the results in the previous section, the most significant reported material contexts was the fridge, the freezer, and the bin. From the reported situations it becomes clear that the fridge

plays many different important roles to people. Most obviously it is used as a storage facility, bearing in mind its intended purpose to store food at home in a cooled environment that slows down natural decay. One respondent describes:

R: Leftovers van het koken en bedorven voedselwaren koelkast

T: Cooking leftovers and rotten food fridge

The phrase ‘food fridge’ used by the respondent highlights a potential difference in the way people use the fridge as a storage facility. In this situation the respondent might use one fridge for the sole purpose to stock food products. In most of the other situations, on the other side, the fridge is an active helper assisting people to transform ‘unstocked’ food products and leftovers into waste, as the following situations show:

R: Een aantal producten in mijn koelkast waren over de datum en heb ik weggegooid

T: A number of products in my fridge were expired and I threw them away

R: Potje pesto in de koelkast was nog niet op maar beschimmeld. Dus moeten weggooien!

T: Pot of pesto in the fridge was not yet finished but mouldy. Thus had to throw away!

R: Sla te lang in de koelkast laten liggen. Bruin uitgeslagen en weggegooid

T: Left lettuce in the fridge for too long. Turned brown and thrown away

R: Een kliekje te lang in de koelkast laten staan, het werd ern schimmelexplosie!

T: Left a leftover in the fridge for too long, it turns into a mould explosion!

R: Ik had teveel rijst gekookt, dit in de koelkast gezet en vervolgens moest ik het weggooien omdat ik er niks meer mee kookte.

T: I had cooked too much rice, put it inside the fridge and subsequently had to throw it away because I did not cook anything with it anymore.

R: de komkommer in mijn koelkast die ik te lang had laten liggen en die ik uiteindelijk beschimmeld heb moeten weggooien.

T: The cucumber in my fridge that I had left for too long and that I had to throw ultimately because it was mouldy.

R: Kliekjes uit de koelkast die daar te lang gestaan hebben --> gft. Restje ontbijt dat niet opgegeten was (vind ik te weinig op te bewaren) --> gft

T: Leftovers of the fridge that were left there for too long → gft. Rest from breakfast that was not eaten (find it too little to keep) → gft

R: Een combinatie van te veel maken en het vergeten om in de koelkast te zetten. En zelfs is het in de koelkast vergeet ik dat er resten zijn.

T: A combination of preparing too much and forgetting to put it inside the fridge. And even if it is inside the fridge, I forget that there are leftovers.

R: Te veel pasta gekookt die we te lang in de koelkast hadden bewaard en Was gaan schimmelen

T: Cooked too much pasta that we had stored in the fridge for too long and was moulding

R: Kaas lag te lang in de koelkast. Hij was zo beschimmeld en voor al zo lang dat ik hem niet meer durfde te eten.

T: Cheese was left inside the fridge for too long. It was so mouldy and in particular so old that I didn't dare to eat it anymore.

The last example demonstrates the interplay of using one's own senses and feelings about quality standards. The respondent could clearly sense that the food as mouldy and under this condition should no longer be consumed safely. However, the respondent highlights the perception of age, and thus a depreciation of quality, was even a more significant factor to consider than the visually noticeable depreciation in the form of natural decay.

Other examples highlights the connection of the fridge with the material properties of the food and the material context of provision:

R: Te lang in de koelkast laten staan / verpakking te groot voor de maaltijd waarvoor ie gebruikt werd

T: Left in the fridge for too long / packaging is too big for the meal for which it was used

R: Pak melk over de datum in de koelkast (te grote verpakking, we kregen het niet op)

T: Package of milk expired in the fridge (too large packaging, we can't finish it)

The above situations highlight how oversized packaging decays or expires in the fridge because people cannot use the food in time. Other examples show how the good intentions of local purchasing lead to a negative experience through the occurrence of waste:

R: Een pond kersen gekocht bij de plaatselijke kersenboer. Binnen 2 dagen zaten er verrotte kersen bij

T: Bought a pound of cherries at the local cherry farmer. Within two days some of the cherries were rotten

R: Teveel komkommers op de markt ingekocht en deze vergeten waren beschimmeld

T: Bought too many cucumbers at the market and forgot about them. They were mouldy

First, in four situations the fridge was the place where people frequently find old products. This goes usually together with a clear purpose for which the fridge is checked more carefully. As one respondent describes:

R: Ik ga op vakantie en maak de koelkast schoon. Hierbij zie ik potjes met indische pasta's die al ruim over data zijn. Ik gooi er ongeveer 3 weg.

T: I go on holidays and clean the fridge. Thereby I find the pots with Indian pasta’s which are already expired for a very long time. I throw away about three of them.

In two situations the respondents identified the fridge as a potential solution to prevent throwing away food. As one respondent says:

R: [...] Plus het was warm dus koele plek of koelkast is goeie plek om dingen langer houdbaar te houden. [...]

T: [...] Moreover, it was warm. Thus the fridge is a good place to preserve things for a longer time.

However, characteristics of the fridge are important to the people and sometimes impede the intention of people to save food in the fridge. One respondent describes:

R: [...], meer plek in de koelkast, [...]

T: [...], more space in the fridge, [...]

Noteworthy, this person lives in a shared flat in which facilities and resources are shared among all household members. The importance of spatial dimension of the fridge echoed with other respondents:

R: Ik vond het heel jammer, omdat er niks meer van de spullen te gebruiken was. Aan de andere kant ook fijn om weer plek te hebben in de koelkast

T: I found it really a pity because none of the things could be used anymore. On the other side also nice to have again space in the fridge

This highlights an important emotional aspect that was confirmed in other studies, that people generally do not like to waste food [19,40,49]. Here, in this

particular situation the positive effect of having freed up space helped the respondent to moderate the feeling of guilt. Another situation highlights the importance of fridge arrangements:

R: Vergeten op te eten, niet goed zichtbaar in de koelkast

T: Forgot to eat, not well visible in the fridge

In other situations the fridge was connected to other material contexts, such as the pan and other objects in which food is frequently left outside the fridge:

R: […] een ruimere koelkast waar een pan in past, of de gewenning restjes meteen koud in een bakje weg te zetten.

T: […] a more spacious fridge that fits a pan, or the habit to put leftovers immediately cold into a pot.

R: Te veel gekocht, niet snel genoeg gegeten, buiten koelkast bewaard

T: Cooked too much, not eaten quickly enough, left outside the fridge

R: […] te veel heb gemaakt en dat het dan buiten de koelkast blijft omdat ik vergeten ben om het binnen te zetten […]

T: […] prepared too much and it remained outside the fridge because I forgot to put it inside.

R: Ik had het eten in de koelkast moeten zetten, of er de volgende dag aan moeten denken.

T: I must have had put the food in the fridge, or must have had thought about

it the next day.

R: Sneller opeten of in de koelkast leggen.

T: Finishing faster or putting inside the fridge.

This situation occurred frequently in the responses. People prepared dinner and subsequently forgot to put the leftovers in an appropriate containment to store it inside the fridge. In other situations the fridge is connected to the ways in which leftovers are stored inside of it. As one respondent describes:

R: In de koelkast verschillende bakjes met restjes verse kruiden.

T: In the fridge different pots with rests of fresh herbs

In this situation, the problem could have potentially been mitigated by storing leftovers in containments that do not decrease their visibility of decay and thus make it more easy for people to visually see the urgency of using the products before their spoilage.

The fridge is also connected to the domestic context of people's lives. One respondent describes the following situation:

R: Ik woon in een studentenhuis.Wij hebben allemaal wel ons eigen plankje in de koelkast en onze eigen lade in de vriezer, maar er blijven toch altijd dingen staan van waarvan we niet weten van wie het is. Eens in de zoveel tijd gooien we dan al dit eten weg.

T: I live in a student flat. We all have our own shelf in the fridge and or own section in the freezer, but still things are always left behind of which we do not

know to whom it belongs. From time to time we then throw all that food away.

This highlights that physical storage space alone does not suffice preventing food from turning into waste but showcases how ambiguities over ownership and responsibilities are connected to the occurrence of food waste. In another situation a respondent explains:

R: Ik moet erkennen dat ondanks dat ik niet veel kaas eet, ik toch ook verantwoordelijk ben voor de hele inhoud van de koelkast.

T: I must realise that although I don't eat much cheese, I am still also responsible for the entire content of the fridge.

This is a good example that shows how even without conflicting ownership and responsibilities, the awareness of the issue does not necessarily translate into action. Yet another response shows how shared responsibilities could help to prevent food waste:

R: We hebben nu een gezamenlijke plank in de koelkast waar restjes op gezet kunnen worden voor iedereen

T: We now have a shared shelf in the fridge where leftovers can be put for everyone

People have ways to moderate the negative emotional effects of wasting food, as the following examples show:

R: Ik vind het zonde, maar heb het restant in kleine stukjes gesneden en

gegeven aan de vogels. Zij hebben de stukjes gekookte volkoren pasta gegeten.

T: I find it sinful, but have cut the leftovers in small pieces and gave them to the birds. They have eaten the pieces of cooked whole grain pasta.

R: Ik had 2 avocado's te lang laten liggen, die waren zuur geworden. Ik heb ze aan de kippen gegeven.

T: I had left 2 avocados for too long, they became acidic. I have fed them to the chicken.

R: Verkeerde olie gebruikt om te frituren. Dus een hele verpakking van 350gr iberian hapjes aan de kippen gegeven

T: Used the wrong cooking oil to fry. Thus, gave an entire packaging of 350 grams of Iberian snacks to the chicken

R: niet/nauwelijks gevoelens, de kippen eten de restjes op, of het gaat de vriezer in voor een dag dat iemand alleen moet eten.

T: not/barely feelings, the chicken eat the leftovers, or it is put inside the freezer for a day when someone needs to eat alone.

Another example describes how people interact with the fridge in a domestic family context:

R: Ik vond achter in de koelkast een jampotje met een bodempje beschimmelde jam. Niet over datum, maar wel beschimmeld. Les hieruit geleerd: de rest van gezin te leren dat ook laatste rest jam op brood kan, voordat men een nieuwe pot open maakt.

T: I found a pot of jam in the fridge, with a layer of mould. Not expired but mouldy. Lesson learned: teaching the rest of the family that also the last rests of jam can be spread on the bread, before one opens a new pot.

This shows that, too, that good intentions to reduce food waste are often not completely realised because routines and practices of individual household members are not aligned with each other. A similar finding was shown by Farr-Wharton et al. [60] that tested the effect of a paper-based colour scheme (colour coding) in household refrigerators to increase awareness of available foods for all members of a household and thereby potentially reduce the amount of expired food. Colours were assigned to particular food types. They found that colour coding raised awareness, particularly for those members not involved in the shopping and initial storage of each food item. This increase in awareness led to a reduction in expiration of food and thus decreased general food waste in households. They conclude that categorisation and efficient communication of such colour-coded information may lead to a reduction in food waste in domestic environments.

Aside spatial dimensions, the expressed idea that better fridge technology could assist the individual at home:

R: Misschien ambitieus maar een koelkast die weet wat er in staat en tot wanneer het houdbaar is. Die me een seintje geeft 2 dagen voordat iets over de datum gaat

T: Maybe ambitious but a fridge that knows what is stored inside of it and until when it can be used. That gives me a notification 2 days before something expires.

The following responses show how people interact with the fridge through food-related practices, in particular though fridge monitoring:

R: Bij het checken van de koelkast bleken er een aantal dingen niet meer bruikbaar te zijn, zoals (ooit) verse kruiden

T: While checking the fridge, a number of things did not seem to be usable anymore, like (once) fresh herbs

R: Minder inslaan beter de koelkast checken

T: Stocking less better checking the fridge

R: Vaker mijn eigen koelkast controleren op door logees achtergelaten voedsel

T: Checking my own fridge more often for food left behind by my guests

R: Proactief en consistent monitoren van eigen voedsel voorraden in met name de koelkast

T: Proactive and consistent monitoring of own food stock, in particular the fridge

These above examples show the difficulty for people to perform the practice of fridge monitoring at the right frequency. In many situations the fridge is checked too late, at occasional intervals—for example, when one breaks out of day to day routines by going on vacations— or not at all.

The fridge is also frequently connected to the socio-temporal context of

everyday life. As one respondent describes:

R: Regelmatig gaan mensen weg voor het weekend en hebben dan iets in de koelkast wat na het weekend over de datum is

T: Regularly, people go away for the weekend and have something stored inside the fridge which is expired after the weekend

In the above example, the other household members of the respondent have a routinised practice of leaving the home for the weekend. In other situations the spontaneity of everyday life requires more attention to prevent food waste, as three respondents admit:

R: lastig. ik vind spontane invallen ook belangrijk. Ik had beter de koelkast kunnen checken voor ik wegging en de broccoli aan de buren kunnen geven. Meer aandacht dus (= vaak tijd)

T: Tricky. I find spontaneous ideas also important. I could have better checked the fridge before I had left and could have given the the broccoli to my neighbours. Thus, more attention (= often time)

R: In principe had ik niet teveel van het product gekocht, maar ik was de afgelopen tijd wellicht wat te weinig thuis om ten volste gebruik te maken van het product.

T: In principle, I didn't buy too much of the product, but I was probably not enough at home recently to make full use of the product.

R: meer ingekocht dan ik eet omdat het programma ineens wijzigt en ik toch

niet thuis eet

T: bought too much than I eat because the schedule suddenly changes and I don't eat at home then

The natural variability of the weather has also an impact, as one respondent describes:

R: Zonde[17], vaak blijft er veel liggen of liggen er aangebroken producten in de koelkast die de volgende dag misschien niet meer op gaan omdat het weer dan anders is.

T: What a sin, often a lot is left over or there is opened packaging in the fridge that are maybe not used up the next day because the weather is different then.

In this example the respondent describes the situation of a BBQ event for which a particular set of food is provisioned. This situation demonstrates two aspects of festive events. First, it shows how certain food products are only useful to people in a particular socio-temporal context (here the BBQ). Second, it provides an example for the 'good provider' identity with which people over provide food to ensure abundance:

R: bij een bbq met vrienden was er meer vlees gekocht dan er behoefte aan was. hierdoor is vlees weggegooid

T: at a BBQ with friends there was more meat purchased than needed.

[17] Dutch expression often used in the context of a wasteful use of resources.

Hereby meat was thrown away

The inherent specificity of food products comes back in other described situations that prevent the use of food in other situations:

R: Gekocht voor bepaalde gerechten en maar gedeeltelijk gebruikt.

T: Purchased for certain products but only occasionally used.

R: Verkeerd product ingekocht. bij het maken van Gaspacho bleek de bleekselderij, waarvan ik dacht dat ik het nodig had voor de Gaspacho, niet in de soep te moeten als ingredient (volgens recept)

T: Purchased the wrong product. While preparing Gazpacho it occurred that celery, of which I had thought that I needed it for the Gazpacho, must not go into the soup as an ingredient (according to the recipe)

Other situations highlight how the demands of the week prevent people from using their leftover foods:

R: Te veel eten over en de rest van de week geen tijd meer om het op te eten

T: Too much food left over and the rest of the week no time anymore to eat it

In the next section I want to take a closer look at the food-related practices, particularly eating. Eating is an important cultural practice and expression of social togetherness. One respondent describes:

R: Ik had voor vier personen gekookt en er belde op het laatste moment 1 persoon af. dus had ik 1 portie over

T: I had cooked for four person and one person canceled the last minute. Thus, I had 1 portion left over

This situation demonstrates how the socio-temporal context of people leads to the occurrence of over provisioned food. Even if the respondent had tried to measure the right amounts for a four-person meal, the temporality of changes to agreements can hardly be foreseen and are outside of the area of influence of the people. Other respondents share this experience:

R: We hadden gekookte spaghetti over (droog, zonder saus) omdat er onverwacht iemand niet mee kwam eten.

T: We had cooked spaghetti left over (dry, without sauce) because unexpectedly someone did not come for eating.

Another practice concerns the storage of food. One situation shows how improper storage leads to food waste despite the good intentions of the person and his willingness to consume the food:

R: ik had een kilo koteletten gekocht. De eerste avond, 3 dagen voor de aangeduide houdbaarheidsdatum er gegeten en het pakje terug in de ijskast. De volgende dag wouden we er nog eens van eten en de rest in de diepvries steken, maar er was naast een lichte verkleuring ook een enorme stank. Ze waren slecht geworden

T: I had purchased a kilo cotlets. The first night, 3 days prior to the official

expiry date, we had eaten it and had put the packaging back inside the fridge. The next day, we wanted to eat some more of it and put the rest in the freezer, but aside a slight colour change there was also an enormous smell. They had turned bad.

14. Discussion

Putting Both Results Into Perspective

“Ik vond het jammer, omdat het producten waren die ik normaal gesproken lekker vind om te nuttigen. Ik was daarom wel een beetje boos op mezelf dat ik ze niet wat meer had gebruikt.”

“I found it a pity because it concerned products that normally find really tasty to eat. Therefore I was a little bit angry with myself that I didn’t use them more often.”

Written by a 22 years old man who shares his kitchen with nine other people.

Linking back my results of the literature research, the 100-100-100 experiment and the open-ended responses to my research questions, I come to the following major discussion points. Food-related practices—such as shopping, cooking, storing, eating—lead to a constant over-provisioning of food at home. This seem to be difficult to prevent as people are confronted with a specific domestic and material context in which they are embedded in. However, as demonstrated by the participants of the 100-100-100 experiment, everyday life contingencies do not necessarily need impede significant reductions that are achievable by individuals and households under the current system. The participants of both analysed clusters demonstrated that for people with a strong environmental self-identity and intrinsic motivation to improve upon one's waste-related practices, changes to the way how one organises his household are possible.

Yet despite these successes, this research has hopefully also contributed to show the complexities at hand when people negotiate their day to day life, often with the good intention not to waste food.

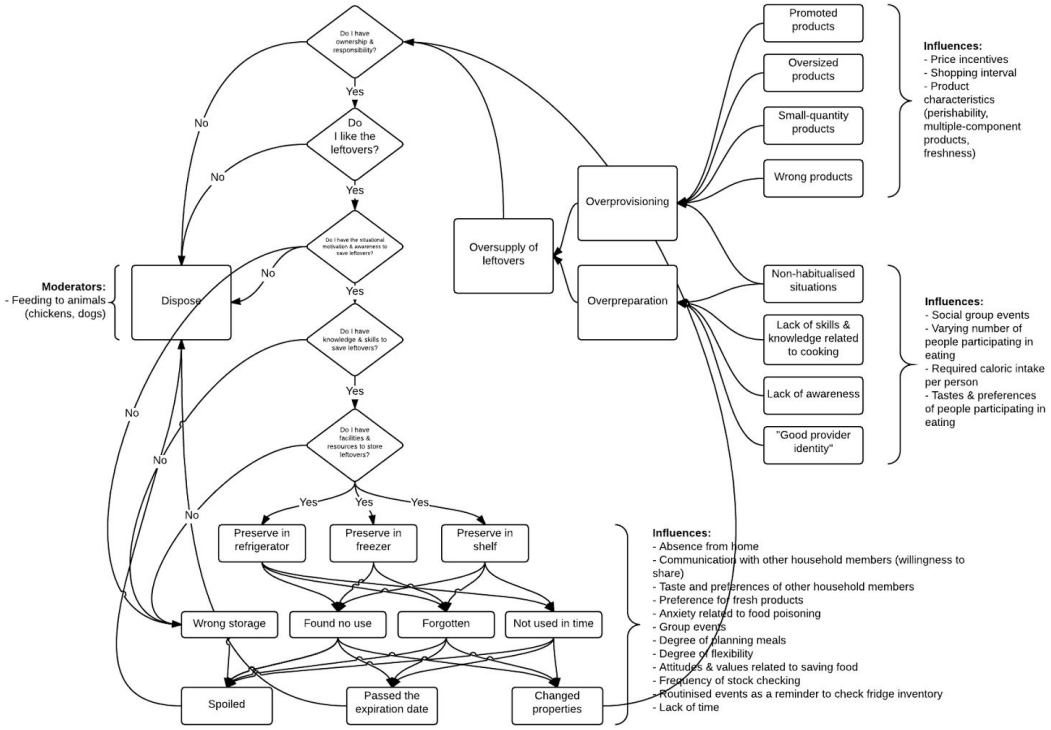

Figure 15: Scheme how people negotiate food waste in their day to day life, based on the results of the collected open-ended responses.

Aside this background, further research could investigate the design of habits that allow individuals to cope with these spontaneous situations. A follow-up study could, for instance, employ the 'tiny habit' concept [61] to design a set of behaviour change interventions that tested whether small behavioural changes can lead to a self-reported reduction of household food waste. These interventions could be promoted to people through visual stickers for the use at home as shown below.

Figure 16: Examples of stickers for the use at home to reduce food waste through small behavioural changes using the 'tiny habit' concept.

Moreover, another important contribution could be made by addressing the relationship between lifestyles and food waste. Previous research has shown that food awareness, waste awareness, family lifestyles and convenience lifestyles were related to food waste production [62]. This suggests that in order to reduce household food waste the diversity of lifestyle factors that can influence food wasting behaviours have to be recognised in order to design waste management systems and policies that can reduce food waste. A follow-up study could explore, based on a theoretical typology as proposed below, the relationship between different expressed lifestyles of people and food waste production, and particularly address how behaviours expressed by a particular lifestyle could be 'nudged' [63,64] or modified by people's motivation to change [65].

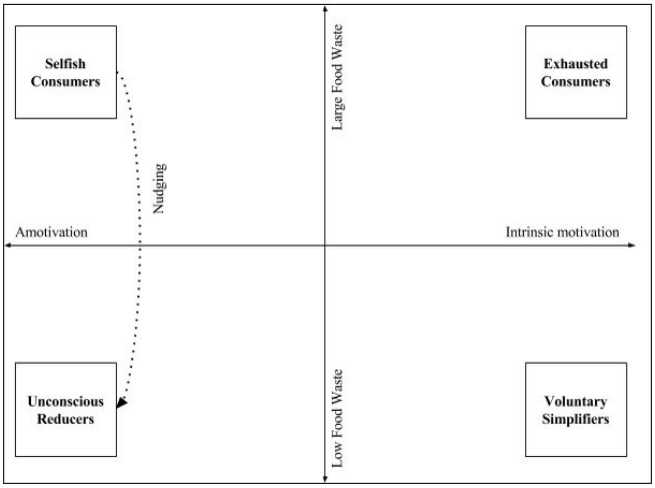

Figure 17: Proposed theoretical typology of the relationship between lifestyles and food waste.

Finally, the results of the 100-100-100 have shown the importance to investigate how people acquire a strong expression of an environmental self-identity [66] that leads to arguably lower waste production than for people with a weak expression of such an identity. A follow-up research could thus explore in more detail how biospheric values and past food-related practices lead to the creation of an environmental self-identity and how this environmental self-identity leads to pro-environmental behaviour and ultimately low food waste production.

15. Conclusion

Final Thoughts On Dutch Household Food Waste And Everyday Life

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“Lichtelijk geïrriteerd. Heb een hekel aan verspilling en de kaas was in eerste instantie niet voor mij gekocht, derhalve voelde ik me niet echt verantwoordelijk.”

“Slightly irritated. I hate waste and the cheese wasn’t bought for me in the first instance, thus I didn’t really feel responsible for it. ”

Written by a 27 years old man who shares his kitchen with one more person.

My intention with this thesis was to study how food ways occurs in the daily lives of Dutch households. Using the 100-100-100 experiment as an opportunity, I was able to identify to what extent people can change individually without changing the social and material context they are embedded in. By collecting open-ended responses of 'ordinary' people I was also able to see how food waste is the result of complex dynamics of everyday life. The lesson I learned from this thesis work is that household food waste is an expression of the challenge of our time, to change the way we live our lives, the way we relate to the 'things' we consume, and more holistically, the way we perceive the world around us [67]. Food waste at home is inherent to how we have organised life as society and how we have decided for ourselves to live our own lives. There is not a single main factor that influences household food waste and both routinised and non-routinised behaviours work against an effective reduction of household food waste. The complexity of managing everyday life makes it difficult for people to avoid or reduce food waste at home, and the permanent satisfaction of one's basic needs in our affluent societies lowers the required awareness to avoid or reduce food waste at home.

The last message I want the reader leave with is motivated by Gjerris and Gaiani [68]. As society we need to develop new narratives to establish cultural habits that replace a focus on affluence and individual choice with a focus on participatory embeddedness in a 'more-than-human' lifeworld.

Bibliography

“Zonde! Pissig op man en kinderen.”

“What a sin! Pissed by my husband and children.”

Written by a 44 years old woman who shares her kitchen with three more person.

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