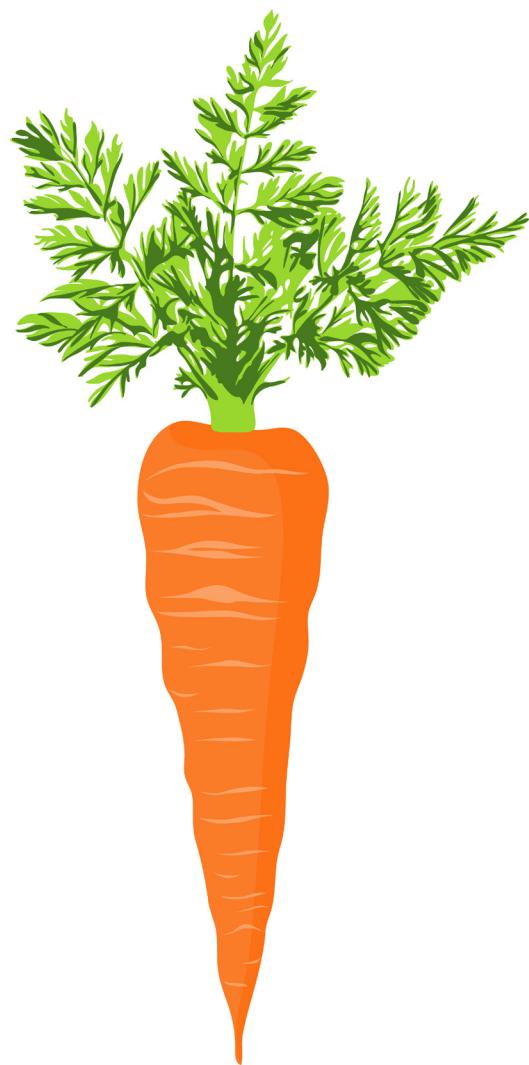


Waste not, Want not

A cross-sectional study on values, beliefs, norms and preceding behaviors that underlie food waste in Dutch households.



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Abstract

Background: Approximately one third of all food gets wasted, which negatively affects the economy, the environment and social standards and structures in society. In the Netherlands, consumers are the group that wastes most food in the supply chain. This study was one of the first to examine 1) how food-wasting behaviors can be explained using VBN theory in order to inform future interventions that aim to reduce food-wasting behaviors in Dutch households, 2) how three preceding behaviors (i.e. using a shopping list, measuring food, using a freezer) could contribute in explaining the complexity of food-wasting behaviors.

Methods: Questionnaire data on sociodemographic variables, values, beliefs, norms, preceding behaviors and wasting behaviors were collected cross-sectionally through online convenience sampling ($N = 706$). Descriptive statistics, correlations and multiple regression analyses were used to examine the role of VBN variables and preceding behaviors in predicting food-wasting behaviors.

Results: Of all VBN variables, personal norms was the strongest predictor of food-wasting behaviors. Beliefs contributed as well, however partially positive, indicating higher levels of food waste. Preceding behaviors (using a shopping list, measuring food, using a freezer) were to a limited extent able to explain food-wasting behaviors. Using a shopping list was the strongest predictor in all regression analyses.

Conclusions: This study proposes to intervene on personal norms by influencing people's beliefs about consequences and responsibilities of food waste. Furthermore, promoting the use of a shopping list in interventions can stimulate reduction of food waste.

Keywords: food waste, behavior change, values, beliefs, norms

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Preface

During the Master program Strategic Communication and Innovation at Wageningen University I became more interested in human behaviors impacting global sustainability. As a person who loves food, I decided to study a downside of food: food waste. I hereby proudly present my thesis, which is a result of six months exploring and learning.

The first person to thank is my supervisor Bob Mulder, whom I have valued for his structured, profound and always enthusiastic involvement. Your available time and qualities as an experienced researcher have helped me to write this thesis. Thanks to our excellent communication skills we managed to discuss this thesis almost completely over the phone.

Second, I want to thank my second supervisor Pieter van 't Veer for enlightening sustainable food processes for me, which gave me a broader perspective on food waste in the starting phase of my thesis.

Third, I would like to thank Olaf, Janne and Fenna, who took the time to help me with the big puzzle called SPSS. Also thanks to Arthur who had to deal with my insecurities from time to time but managed to motivate and support me.

Last, I want to thank all 706 respondents who made it possible for me to write this thesis. A special thanks to the Netherlands Nutrition Centre for sharing my questionnaire on their Facebook page. This really contributed to the sample of my study.

I hope this thesis can add to the reduction of households food waste. For all readers: don't waste food and enjoy reading!

1. Introduction

According to the Food and Agricultural Organization (FAO) 1,3 billion tons of food are wasted worldwide each year. This means that a third of the entire food production gets wasted. Food waste is food loss occurring during the retail and final consumption stages due to the behavior of retailers and consumers (Gustavsson, Cederberg, Sonesson, Otterdijk en Meybeck, 2011). This means that a lot of food is thrown away despite the fact that it is still fresh and edible.

Food waste happens throughout the entire food supply chain. “A supply chain is a global network used to deliver products and services from raw materials to end customers through an engineered flow of information, physical distribution, and cash” (Walker, 2004). Apart from the global level, products are produced on a national level as well. Supply chains consist of multiple entities such as farmers, transporters, processors, wholesalers or retailers and consumers. Each entity fulfills a step in the chain from raw material towards consumable items. Supply chains are unique, based on factors such as the infrastructure, the amounts of retailers or transport available.

In the Netherlands, the total amount of food waste in the supply chain is estimated at 4,4 billion euros a year. Of all groups in the chain, consumers waste the most. Approximately 2,4 billion euros of food is wasted by them. This is 0,8 billion kg of food (Milieu Centraal, 2012). On an individual level, this means consumers waste an average of 50 kilos of food per person per year, this is similar to 150 euros per person per year (van Westerhoven, 2013) (CBS, Statline, n.d.). Products that get wasted most often are milk and milk products, bread, vegetables, fruit, sauces, oils and fats (van Westerhoven, 2013).

1.1 Why is food waste a problem?

Wasting food has a big impact on multiple dimensions of society. Three categories can be distinguished.

First, food waste has an economic impact. Food that gets thrown away by farmers, supermarkets, consumers, etc. must be managed which causes costs. One example is wasted food that is processed to feed livestock. This involves costs such as processing the wasted food and its transportation. Other economic impacts contain the use of landfills and other operating costs (WRAP, 2009).

Second, food waste has an impact on the environment. Energy is needed to produce food. However, when too much food is produced and therefore wasted, the energy that was

used to produce it also gets wasted. For example, freshwater and fossil fuels that are used to produce food, along with methane and CO₂ emissions from decomposing food, impacts global climate change (Hall, Guo, Dore and Chow, 2009). Also, the cultivation of food, its transport, preparation and packaging impacts the environment by the emission of greenhouse gases. Concluding, food waste results in an unnecessary use of energy that has a negative impact on the environment (Milieu Centraal, 2012).

Third, food waste has a social impact. Quality standards for shape and appearance of food increase the amount of food that is wasted. It is estimated that 5% to 10% food gets wasted because it does not meet the quality requirements of consumers and supermarkets. Toine Timmermans, researcher at Wageningen UR, thinks that supermarkets and consumers got used to perfect straight cucumbers and clean apples without stains. Therefore farmers are not able to sell bended cucumbers and ‘ugly’ apples to supermarkets so they get wasted, even though it is edible. (Timmermans, 2011). It seems that this phenomenon has created a social norm that tells not to eat ‘ugly’ food. By throwing away ‘ugly’ food, the social norm is maintained which makes the social impact both cause and effect of the problem. On the contrary, food waste congregates people within action groups that strive to reduce food waste. This can be seen as a social impact on society resulting from the food waste problem.

Besides these three categories one can also think of the moral impact food waste has. It is hard to understand and accept the fact that people die from malnutrition whereas others over consume food. The director-general of the FAO José Graziano da Silva stated that “In addition to the environmental imperative [to reduce food waste], there is a moral one: we simply cannot allow one-third of all the food we produce to go to waste, when 870 million people go hungry every day” (Johnston, 2013).

1.2 Existing studies

The food-wasting problem is broad and complex. An overall study on this subject would be equally broad. Therefore this study will focus on one target group only, namely Dutch households, since households as a group waste most of the food in the supply chain. This study will investigate households’ food wasting behavior and attempt to explain it. A properly operationalized understanding of this behavior can form a beginning for understanding the complexity of the entire food-wasting problem. The review of theoretical and empirical literature provides insights in the mechanisms that underlie behavior and shows how food-wasting behavior can be predicted.

Remarkably, there have been little studies that focus on identifying the core of household food-wasting behaviors and on how this behavior can be changed. Additionally, existing studies focus mostly on one country. Since eating- and cooking habits differ in each country or culture, it is difficult to generalize findings worldwide. Because food waste is such a complex problem with many causes and different interpretations, the field of studies on food-wasting behavior is fragmented. All these studies, however, contribute to a solution on the problem in their way. Recent studies in this area attempt to understand food waste and give various explanations of the problem.

Quested, Marsh, Stunell and Parry (2013), who work for the Waste and Resources Action Programme (WRAP), looked into this complexity in UK households. The study proposed several reasons that make food waste a complex matter. Habits are likely to play an important role in behaviors relating to food waste in households. Both waste behavior and food choice have a strong habitual element given their automaticity and frequency. The habitual character implies that food-wasting behaviors are being performed with less conscious thought. This makes changing food wasting behavior challenging. Secondly, Quested et al. (2013) states that a difficulty for (smaller) households is that food is often only available in larger quantities. This external factor makes efficient provisioning challenging and subsequently people (have to) waste the leftover food.

Graham-Rowe, Jessop and Sparks (2015) conducted one of the first studies, which applied the theory of planned behavior to household's food waste reduction. The study tested the utility of applying an extended TPB model to household food waste reduction in the UK and focused on fruit and vegetable waste only. It was found that if people intended to reduce food waste, it was likely that there was an actual reduction in household fruit and vegetable waste. However, the amount of variance in behavior accounted for by the TPB model was relatively small (5%).

Farr-Wharton, Foth and Hee-Jeong (2014) identified factors that promote behaviors causing household food waste. They proposed that consumers often do not know what food they have available at home, which they call supply knowledge. Likewise, they distinguish location knowledge: consumers do not know how and where to storage food items properly. Finally there is food literacy. This refers to the consumers experience and knowledge on food waste problems which influence their food-wasting behavior. Farr-Wharton et al. proposed some opportunities to influence consumer behaviors. Two examples are: supporting consumer education regarding food literacy and interventions aiming at assisting systematic storage practices in household fridges. Stefan, van Herpen, Tudoran and Lahteenmaki (2014) found

that for Romanian consumers planning and shopping routines are important predictors of food waste. Their advice, that campaigns should aim at changing planning and shopping routines, connects to Farr-Wharton et al. (2014) by focusing on education for the consumer.

Evans (2011) conducted a study in the UK that specifically focused on the broader social and material conditions through which food is provisioned, instead of the individual only. Evans concluded that “it is somewhat perverse to position food waste as a matter of individuals making negative choices to engage in behaviors that lead to the wastage of food.” He states that waste is a consequence of the ways in which domestic food practices are socially organized. Similar to Quested et al. (2013), he states that habits and fixed eating routines can lead to food waste, or a mismatch between food that is provisioned and food that is eaten. Anxiety for food illness risks can also explain food being wasted. He states that food waste occurs as a consequence of households negotiating the contingencies of everyday life. Parizeau, Von Massow and Martin (2014) connect to this vision and conclude that it is important to understand households’ lifestyles, attitudes, habits and institutional contexts. They conducted a study in Canada which purpose it was to combine observations of organic, recyclable, and garbage waste production rates to survey results of food waste-related beliefs, attitudes, and behaviors at the household level. They found that food waste production was related to many different factors such as shopping practices, food preparation habits, food related attitudes and beliefs and lifestyles. Furthermore, they state that household food wasting behaviors can be influenced in distinct ways by, for example, food awareness (conscientiousness in eating habits), waste awareness (conscientiousness about waste and its impact), family lifestyles and convenience lifestyles. Parizeau et al. state that it is important to understand the diversity of factors that can influence food-wasting behaviors at the household level in order to design policies to reduce food waste.

Another factor contributing to food waste is the increased availability of affordable food. Gjerris and Gaiani (2013, p.8) state: “Food is for most citizens in the industrialized world abundant, cheap, and available everywhere and at any time.” They also point at factors such as consumerism and contemporary hectic lifestyles that evolved in the last decades. Other factors influencing food waste are the size and composition of households. Food waste is significantly influenced by the composition of the family. Adults waste more in absolute terms than children, and larger households waste less per person than smaller households. Household demographics and income are also cited in the article. The study suggests that young people waste more than older people, with pensioner households wasting the least and lower-income people are believed to waste more food because they are less likely to plan their

shopping (Gjerris & Gaiani, 2013).

The complexity of investigating food-wasting behavior is big. Multiple studies with distinct purposes have been conducted but it remains difficult to determine the core reasons of food wasting behavior and how they can be influenced. This kind of theory-driven research, however, means an important step in identifying the factors that underpin household food waste reduction. Theory is needed to provide a framework from which causal processes can be identified and can guide the development of effective interventions (Michie, Johnston, Francis, Hardeman and Eccles, 2008).

1.3 Purpose of this study

This study is one of the first to use Value Belief Norm theory (Stern, 2000) as an explanatory theoretical framework for food waste in households. This resulted in the following research question:

Based on pro-environmental values, beliefs and personal norms, how can we explain food-wasting behavior in Dutch households?

Furthermore, based on literature and logic reasoning (see chapter 2), this study will focus on three specific behaviors that possibly precede actual food waste: using a shopping list, measuring food, and using a freezer. The following sub question complements the research question and will therefore be addressed in the present research as well:

How can we explain food waste according to the following preceding behaviors: using a shopping list, measuring food and using a freezer?

Ultimately, the knowledge derived from the present study can be used to address food-wasting behavior through theory-and evidence-based interventions.

2. Theoretical background

The first part of this theoretical background attempts to clarify the food waste topic. Food waste as a whole is mapped and then narrowed down to the topic of this study: food waste in households. The second part of the literature review focused on VBN theory, which functions as theoretical framework in this study.

Food wasting behavior is complex because it is often not related to one single behavior. Research of Quested et al. (2013), has demonstrated that there are many reasons why food is wasted and that multiple behaviors lead to this waste. In this light, food waste is best viewed not as a single behavior but as the result of multiple behaviors that can increase the likelihood or amount of food being wasted (Quested et al., 2013). This means by the time an item of food is thrown away, the opportunity to prevent that food from becoming waste has usually passed. The action, or actions, leading to the waste may have already been some time in the past, often many days. These behaviors are, for example, planning, shopping, storing, preparing and consuming food. This study will look at these behaviors and refer to them as ‘preceding behaviors’, because they precede food waste.

Taking this into account, besides food-wasting behaviors, various categories of behavior that precede food waste will be addressed in the present research. The Netherlands Nutrition Centre (het Voedingscentrum, 2014) distinguishes three categories that represent the so-called preceding behaviors, which correspond with Quested et al.’s findings (2013): purchasing, preparing and storing.

First, poor planning of purchases often leads to buying more food than is needed, for example, the impulsive purchasing of food that is not required immediately. Second, poor food preparation techniques often lead to less food being eaten or food quality losses, ending up as waste. This is often due to a lack of knowledge on how to consume or prepare food more efficiently. Last, poor storage management skills in the home can lead to more food being wasted. A major part of food losses occurring in households seems to be from inadequate cool storage equipment or their misuse. An example of poor storing: products that are not visible at the back of the fridge or freezer will decay unseen. Here, poor storage management results in rotten products getting wasted (EU FUSIONS, 2014).

Within each category, Quested et. al (2013) has identified several individual behaviors that can contribute to food waste reduction and that have the potential to be monitored via a questionnaire. Taking multiple single behaviors as focus helps break down the complexity of food-wasting behavior. Therefore, the present research will focus on three preceding behaviors, one within each category (Table 1).

Table 1 Preceding behaviors per category

Category	Preceding behavior
Purchasing	Using a shopping list
Preparation	Measuring food
Storing	Using a freezer

These preceding behaviors are called pro-environmental behaviors since they contribute to decreasing the food waste problem. Following Stern (2000), pro-environmental behaviors are defined as “those behaviors that change the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere positively.” (p.408). *Using a shopping list* is associated with purposeful shopping and therefore not buying products that are not needed with the risk of ending up as waste. *Measuring food* helps decreasing food waste because people only prepare the food that is needed. Instead of randomly boiling (too much) pasta, measuring according to the amount of eaters can help reduce food waste. *Using a freezer* is associated with the extension of the shelf life of food and thus less food waste.

2.1 Value Belief Norm theory

In the present research, Value Belief Norm theory will help to investigate which values, beliefs and norms underlie both the preceding behaviors and actual food-wasting behaviors of individuals. This section will first explain Value Belief Norm theory after which empirical evidence will be given.

Value Belief Norm (VBN) theory of Stern (2000) forms a base and guidance in understanding individual behaviors. Knowledge on individual values, beliefs and norms are needed in order to design useful theory-and evidence-based interventions aimed at reducing food waste. Stern (2000) explains that environmentalist personal norms and the predisposition to pro-environmental action can be influenced through information that shapes values and beliefs of an individual. Pro-environmental behavior can be affected by the findings of environmental science about consequences, publicity and commentary about those findings. The actual and perceived openness of the political system to public influence, may also affect pro-environmental behavior since this may influence perceptions of personal responsibility (Stern, Dietz, Kalof and Guagnano, 1995).

The most striking element of VBN theory is the combination of multiple behavioral theories into one more comprehensive theory. As mentioned earlier, food-wasting behavior is

complex and diverse because it comprises multiple determinants. VBN theory seems promising in exploring and understanding this complexity because of its broad approach.

VBN theory starts with an orientation of an individual's values. According to Steg, Dreijerink and Abrahamse (2005), values generally do not have strong direct effects on behavior. However, the relationship between general values and behavior seems to be mediated by other factors like behavior specific beliefs or personal norms (Steg et al., 2005). VBN theory accounts for this mediation explains Stern (2000, p.412): "[...] VBN theory offers what we believe to be the best explanatory account to date of a variety of behavioral indicators of non-activist environmentalism. The theory links value theory, norm-activation theory, and the New Environmental Paradigm (NEP) perspective through a causal chain of five variables leading to behavior".

According to VBN theory, a sequence of values, beliefs and norms of an individual predicts pro-environmental behavior (Figure 1).

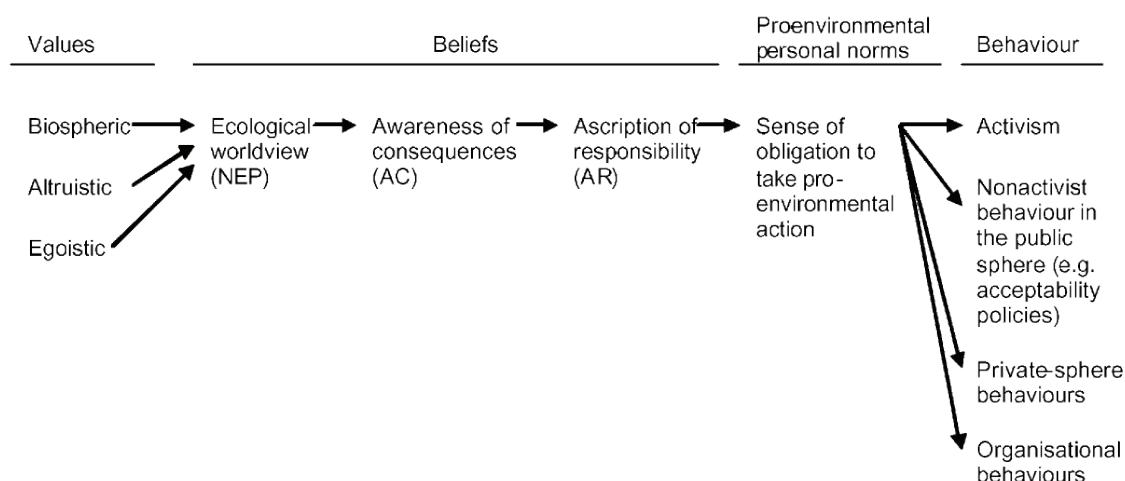


Figure 1. A schematic representation of VBN theory (Stern, 2000)

The sequence starts with relatively stable and general values. Stern et al. (1993) describe three general value orientations that may be relevant for understanding environmental beliefs. The biospheric value orientation reflects an individual's concern about nonhuman species or the biosphere. The egoistic value orientation reflects if people try to maximize individual outcomes, whereas the altruistic value orientation reflects an individual's concern for the welfare of other human beings.

These values influence an individual's beliefs about that person's relation with the environment. This is called the 'Ecological worldview'. The Ecological worldview is believed

to affect awareness of consequences (AC), which are specific beliefs on consequences of environmental behavior. For example, an individual is aware that food waste contributes to food scarcity in the world. This AC then affects the ascription of responsibility (AR), defined as the individual's responsibility for these problems and for taking corrective actions. For example, "I add to this problem because I throw away food". Next, these beliefs result in 'pro-environmental personal norms'. Eventually these values, beliefs and personal norms lead to four types of pro-environmental behavior (Steg et al., 2005).

Next, VBN theory distinguishes four types of environmental behavior; activism, nonactivist behavior in the public sphere, private-sphere behavior and organizational behavior. According to Stern (2000), these are behaviors taken with pro-environmental intent. Furthermore, they differ in to what extent people act pro-environmentally or how they are involved in environmental organizations and in what context (at home or in organizations). The present research covers private-sphere behaviors since this corresponds with household food-waste very well. It means the purchase, use, and disposal of personal and household products that have direct environmental consequences.

2.2 Empirical evidence

Earlier research has proven the effectiveness of VBN theory and several studies confirm the predictive value of VBN. Value orientations, environmental beliefs, and norms are factors that have shown to influence specific pro-environmental behaviors such as recycling, consumption, energy conservation, choice of travel mode and general pro-environmental behavior (Oreg & Katz-Gerro, 2006).

A study on factors influencing the acceptability of energy policies by Steg et al. (2005) suggest that VBN theory is successful in explaining judgments of acceptability of energy policies. The paper shows that all variables were significantly related to the next variable in the causal chain. For example, personal norms explained 29% of the variance in acceptability. In turn, almost 50% of the variance in personal norms can be explained by values and beliefs.

Another study, one towards sustainable transportation in Argentina (Jakovcevic & Steg, 2013) found that the VBN theory was successful in explaining policy acceptability and intention to reduce car use in Argentina. In addition, results showed support for the causal structure of the variables in VBN theory as well. The article shows that the full VBN model, including all variables preceding personal norms, explained 45% of the variance in personal norms. AC, AR and biospheric values contributed significantly to this model. The more respondents were aware of the problems caused by car use, the more they felt responsible for

car use problems, and the stronger their biospheric values, the more they felt morally obliged to reduce car use.

Steg et al. (2005) suggest that the predictive power of VBN theory seems to differ for different behavior domains. This may depend on how much it will cost an individual to act pro-environmentally in terms of money, effort and time. Relatively costly behavior, for example the use of a car or subway, is less strongly related to personal norms than is less costly behavior, such as recycling waste.

3. Method

3.1 Design and procedure

For this study a cross-sectional research design was chosen. The method of data collection consists primarily of a questionnaire study, preceded by, and based on, a literature review. The questionnaire was developed using Qualtrics, a provider of online survey software. Before the questionnaire was distributed, five people tested it to remove possible flaws and to enhance the overall quality.

The questionnaire was distributed through convenience sampling. The researcher of this study spread the questionnaire amongst acquaintances, family and students and asked them to participate and to spread the questionnaire in their own networks. This was done via e-mail and social media such as Facebook and Twitter. Furthermore, the Netherlands Nutrition Centre shared the questionnaire on their Facebook page, which has approximately 30.000 followers. To make participation more attractive, four bol.com coupons, each worth ten euro, were raffled afterwards.

On social media, the e-mail and in the introduction of the questionnaire, it was explained that the questionnaire comprised questions about grocery shopping and cooking. These somewhat neutral terms (in stead of ‘food waste’) were deliberately chosen to prevent respondents from being primed to the food waste topic in advance.

Since the amount of behavioral research on food waste is relatively small, this study was not able to use validated measurement scales (other than VBN measures). As far as known, the confounders, preceding behaviors and food-wasting behaviors as used in this study were never measured in this formation before. This study explored whether demographic variables and confounders were significantly related to food waste. Demographic variables that were tested were: age, gender and educational level. The two confounders were: how often people cooked and how often people shopped for groceries.

3.2 Measures

The questionnaire consisted of seven parts. Five parts cover concepts from VBN theory and two parts cover questions about preceding behaviors, food waste behaviors and demographic data. Each part contained questions covering one topic that was shown on one or two pages in order to give the questionnaire an accessible appearance for the respondents. The sequence of questions was similar to Steg et al.'s (2005) study based on VBN theory. To reduce the chance of socially desirable answers to the questions about food-wasting behaviors, concepts covering personal norm, AC, AR and NEP were included after the questions about food-wasting behaviors (Steg et al., 2005). The questionnaire ends with demographic characteristics. This was the last part in order to prevent respondents from relating age, gender or education with the topic.

The first part of the questionnaire assessed respondent's values using a short version of Schwartz's (1992) universal value scale as adapted by Jakovcevic & Steg, 2013. Respondents could answer on a nine-point Likert scale ranging from 0 being 'not important' to 7 being 'extremely important'. Respondents also had the option of answering '-1', which indicated that they were opposed to the value (Steg et al., 2005; Jakovcevic & Steg, 2013). Reliability for the total scale of values corresponded with Cronbach's alpha = .71 ($M = 6.10$, $SD = .76$). In total 13 values were given, five of which reflected egoistic values: authority, wealth, social power, influential and ambition. An example of an item measuring egoistic values: "*Influential: having an impact on people and events*". Four reflected altruistic values: social justice, equality, a world at peace, and helpful (Cronbach's alpha = .69, $M = 7.28$, $SD = 1.03$). An example of an item measuring altruistic values: "*Equality: equal opportunity for all*". Four reflected biospheric values: preventing pollution, protecting the environment, respecting the earth and unity with nature (Cronbach's alpha = .87, $M = 6.81$, $SD = 1.37$). Measuring biospheric values contained items such as: "*Respecting the earth: live in harmony with other species*".

In both studies (Steg et al. 2005; Jakovcevic & Steg, 2013), a confirmatory factor analysis (Multiple Group Method) was performed to verify whether the data supported the groupings of items into the three types of value orientations. The analysis revealed that each item correlated strongest to the value orientation that it was assigned to, based on theoretical expectations. Given this evidence of empirically supported value clusters, this study adopted the same clusters to measure respondents' value orientations. Furthermore, since the confirmatory factor analysis also revealed strong correlations for the groupings AC, AR and

PN in previous studies (Steg et al. 2005; Jakovcevic & Steg, 2013), this study adopted these clusters as such as well.

Second, preceding behaviors and food-wasting behaviors were measured. First, the preceding behaviors *using a shopping list*, *measuring food* and *using a freezer*, have shown to contribute to less food being wasted (Quested et al., 2013) and therefore functioned as behavioral measures in this study. The aim of these questions was to explore the extent to which they are indeed associated with food-wasting behaviors, as has been suggested (Quested et al., 2013). Nine questions were given to measure preceding behaviors, of which two questions were about preparation of food (e.g. “*How often do you have leftovers after cooking?*”) (Cronbach’s alpha = .36, $M = 8.35$, $SD = 2.48$). Three questions reflected purchasing behaviors, for example: “*How often do you use a shopping list when you buy groceries?*” (Cronbach’s alpha = .05, $M = 11.92$, $SD = 2.51$). Four questions were about storing (e.g. “*How often do you use your freezer to store leftover food?*”). Cronbach’s alpha was calculated for *using a freezer for fresh food* and *using a freezer for prepared food* since they were measured with the same scale (Cronbach’s alpha = .55, $M = 9.44$, $SD = 2.65$). Two other questions about storing had different scales (yes/no and indicating sort freezer) and were therefore not included in the reliability analysis. Additionally, four questions were given that measured wasting behaviors (e.g. “*How often do you usually waste food?*”, “*How often do you waste food because it was stored in the freezer too long?*”, “*How often did you waste fresh food in the past week?*” and “*How often did you waste prepared food in the past week?*”). The first two questions could be answered on a seven-point scale to indicate how often a certain behavior was performed, ranging from ‘never’ to ‘always’ (Cronbach’s alpha = .58, $M = 4.72$, $SD = 1.56$). The last two questions were quantitative measures and could be answered on a scale ranging from ‘0 times’ to ‘more than 7 times’, indicating the frequency they wasted fresh or prepared food that week (Cronbach’s alpha = .49, $M = 3.65$, $SD = 1.65$). The questions about *general food waste*, *wasting fresh food* and *wasting prepared food* were chosen to indicate food waste in the statistical analyses. The indicators measure slightly different things, which might give a more nuanced image in the complexity of food waste. The question including a freezer focused on the use of a freezer too much and was therefore considered as a preceding behavior and not as a direct indicator of food waste in the statistical analyses.

Furthermore, it was explored whether confounders could be used in this study. Two questions (i.e. “How often a week do you usually cook?” and “How often a week do you usually buy groceries?”) were used as possible confounders because they were likely to be

related to food waste. Both questions could be answered from ‘never’ to ‘more than 7 times’.

The next three parts of the questionnaire consisted of 17 items, five that measured awareness of consequences (AC) (Cronbach’s alpha = .79, $M = 5.46$, $SD = .85$), six items measuring ascription of responsibility (AR) (Cronbach’s alpha = .68, $M = 4.86$, $SD = .94$) and six items measuring personal norms (PN) (Cronbach’s alpha = .78, $M = 5.66$, $SD = .88$). AC, AR and PN items were adapted to the food waste topic. Respondents could indicate to what extent they agreed with the statement on a seven-point scale ranging from ‘totally disagree’ to ‘totally agree’. An example of an item measuring AC was: “*It is not certain whether food waste is a real problem*”. An example of an item measuring AR is: “*I feel partly responsible for throwing away food*”. Last, a statement to measure PN was for example: “*I feel guilty when I waste food*”.

In the last part of the questionnaire, respondents filled out the NEP scale (Dunlap et al., 2000) that consisted of 15 statements measuring ones ecological worldview (Cronbach’s alpha = .77, $M = 53.81$, $SD = 6.22$). Respondents could indicate to what extent they agreed with the statements on a five-point scale, the same as how sociologist Riley Dunlap and colleagues devised it. Examples of NEP-statements are: “*We are approaching the limit of the number of people the Earth can support*” and “*Humans are seriously abusing the environment*”. This study used the Dutch version of the NEP-scale that was translated and used by Linda Steg.

3.3 Statistical analysis

Variables that measured NEP, AC and AR were recoded such that responses to the negatively formulated items were in line with responses to the positively formulated items (i.e. higher scores indicating more agreement with given statements for NEP, AC and AR). After that, mean scores for all scales that measured concepts from VBN were computed. The mean scores for these concepts (egoistic values, altruistic value, biospheric values, NEP, AC, AR and PN) were used in further analyses.

Furthermore, preliminary analyses showed low Cronbach’s alpha when preceding behaviors were combined into the categories preparation, purchasing and storing of food. Furthermore, food-wasting measures also resulted in a low Cronbach’s alpha when put together. Therefore questions indicating preceding behaviors and food waste were relabeled and used as single items in the statistical analyses. See table 2.

Table 2 Relabeled items for statistical analyses

	Questionnaire item	Relabeled item
Preceding behaviors	- How often do you use a shopping list when you buy groceries? - How often do you measure food according to the amount of eaters? - How often do you use a freezer to store prepared food? - How often do you use a freezer to store fresh food?	Using a shopping list Measuring food Freezer prepared food (using a freezer) Freezer fresh food (using a freezer)
Food waste behaviors	- How often do u usually waste food? - How often did you waste fresh food in the past week? - How often did you waste fresh food in the past week?	General food waste Wasting fresh food Wasting prepared food

3.3.1 Correlations

Pearson's correlations were computed to explore how 13 scale variables that represented preceding behavior, food-wasting behavior and VBN theory, could be associated with each other. For this matrix a bivariate correlation was conducted.

3.3.2 Multiple Regression analyses

Six multiple regression analyses were done that were divided into two sets. A block-wise entry method was used for all regressions (i.e. hierarchical regression).

The first three multiple regression models studied the effects of the three preceding behaviors (i.e. using a shopping list, measure food, and using a freezer, for storing prepared food or for storing fresh food,) on three dependent variables (DV) representing food waste: *general food waste*, *wasting fresh food*, and *wasting prepared food*.

In the second set, three multiple regression models were run to predict food waste from the variables from VBN theory. The analyses studied the effects of PN, AR, AC, NEP, egoistic values, altruistic values and biospheric values on three dependent variables: *general food waste*, *wasting fresh food*, and *wasting prepared food*. As mentioned before, this study is explorative because the amount of behavioral research on food waste is relatively small and no validated measurement scales (other than VBN measures) exist. As far as known, this study is the first to measure these confounders (whether people cooked and whether people

shopped for groceries), preceding behaviors and food-wasting behaviors, which makes this an explorative part in this study. Eventually, non-significant demographic variables and/or confounders will be removed from the model.

4. Results

4.1 Sample

In total, 749 questionnaires were started of which 706 were completed (6% drop-out). Most respondents were females (89%). Of all the respondents, most people were employed (66%) and had a higher educational (Dutch HBO) or university degree (69.2%). Of the 706 respondents, the two largest groups represented ‘couples with children’ and ‘multiple persons without children’. For a complete overview of sample characteristics, see table 3.

Table 3 Sample characteristics (N = 706)

Characteristics		N (%)	Mean (SD)	Range
Age		705	37.8 (14.5)	18-75
Gender	<i>Male</i>	78 (11%)		
	<i>Female</i>	628 (89%)		
Current status	<i>Employed</i>	466 (66%)		
	<i>Unemployed</i>	109 (15.4%)		
	<i>Student</i>	131 (18.6%)		
Level of education	<i>University degree</i>	261 (37%)		
	<i>Higher educational degree (HBO)</i>	227 (32.2%)		
	<i>Secondary vocational education (MBO)</i>	116 (16.4%)		
	<i>High school</i>	101 (14.3%)		
	<i>Primary school</i>	1 (0.1%)		
Household	<i>Couples with children</i>	181 (25.6%)		
	<i>Couples without children</i>	152 (21.5%)		
	<i>Multiple persons without children</i>	163 (23.1%)		
	<i>Multiple persons with children</i>	22 (3.1%)		
	<i>Single households</i>	135 (19.1%)		
	<i>One parent with children</i>	25 (3.5%)		
	<i>Other</i>	28 (4%)		

4.2 Food waste and associated behaviors

4.2.1 Food-wasting behaviors

Results of the questionnaire concerning wasting behaviors and preceding behaviors are shown in table 4. Additionally, this section will complement the given information in table 4 with other results of the questionnaire.

Table 4 Food wasting behavior statistics

	Wasting behaviors	N	Mean (SD)	Range
Wasting behaviors	General food waste	706	2.73 (0.9)	1-6
	Wasting fresh food (times per week)	706	1.84 (1.0)	1-9
	Wasting prepared food (times per week)	706	1.81 (1.0)	1-8
Preceding behaviors	Using a shopping list (when shopping for groceries)	702	5.12 (1.8)	1-7
	Measuring food (when cooking)	702	3.71 (1.8)	1-7
	Using a freezer for prepared food	682	4.11 (1.6)	1-7
	Using a freezer for fresh food	682	5.33 (1.5)	1-7

Table 4 showed especially low mean scores for wasting behaviors, which indicated a low amount of reported food waste. *General food waste* was measured on a 7-point Likert scale and showed the highest mean score of all wasting behaviors. This mean score indicated that most people in this category *generally wasted food* ‘almost never’ (41.9%) and the second largest category wasted ‘sometimes’ (32.3%). Furthermore, as the Range in table 4 indicated, none of the respondents ‘always’ *wasted food generally*.

Wasting fresh food and *wasting prepared food* were measured on a quantitative scale. Both showed very low mean scores while it was measured on a 9-point scale. A striking result is that in contrast to *general food waste*, much more people (48.4%) replied that they had ‘never’ *wasted prepared food* in the past week. This was almost similar for *wasting fresh food* where (44.6%) reported ‘never’. There was some resemblance in the second largest category, which represented wasting ‘once’ that week, for both *wasting prepared food* (32.7%) and *wasting fresh food* (36.4%). These large percentages explain the low mean score for *wasting fresh and prepared food*. A notable difference between the two is that *fresh food* was wasted more than 7 times (Range = 1-9), whereas *prepared food* was never wasted more than 7 times (Range = 1-8).

4.2.2 Using a shopping list, measuring food and using a freezer

Using a shopping list was the most performed preceding behavior, as the mean scores in table 4 indicated. Results of the questionnaire showed that 31.9% ‘always’ *used a shopping*

list when doing groceries and 22.9% *used a shopping list* ‘most of the time’. Only 3.7% ‘never’ *used a shopping list*.

Measuring food had a lower mean score and results showed that people who ‘always’ *measured food* formed the smallest category (7.1%). This is in contrast to *using a shopping list* where ‘always’ formed the largest category. Furthermore, 20.1% wasted ‘almost never’, which forms the largest group. Only 2.5% ‘never’ *measured their food*.

682 respondents (96.6%) were in possession of a freezer. *Prepared food was stored in the freezer* ‘regularly’ by most people (20.3%) and only 9.8% did this ‘always’. Furthermore, 5.4% ‘never’ *used their freezer to store prepared food*. Mean scores imply that a freezer was used more often to *store fresh food* than for *prepared food*. Respondents that ‘always’ used their *freezer to store fresh food* formed the largest category (28.3%), which is almost three times higher than for *prepared food*. However, only 0.8% ‘never’ used their *freezer to store fresh food*, which in turn contradicts *prepared food*. For more results see table 4.

4.3 Correlations

First, the data were explored through examining Pearson correlations for 13 variables that represented food-wasting behavior and VBN theory. Multiple expected relations were observed. In the correlation table it is notable that the three preceding behaviors are positively correlated to each other. *Using a shopping list* correlated positively with *measuring food* (.265, $p < 0.01$), *using a freezer for fresh food* (.222, $p < 0.001$) and *prepared food* (.136, $p < 0.001$). *Using a shopping list*, *measuring food* and *using a freezer* correlated negatively to food waste. This corresponds with the expectations (i.e. someone who uses a shopping list, is likely to waste food less often). *General food waste* correlated significantly to all variables except for altruistic values (which has no significant correlation with food waste variables at all). *Wasting fresh food* and *wasting prepared food* correlated with other variables less often. It is notable that VBN variables correlated relatively strong with each other. As expected, egoistic values correlated negatively with biospheric values (-.120, $p < 0.001$) and NEP (-.127, $p < 0.001$) (implying that concerns about self are associated with lower environmental concern, according to Steg et al., 2005). All other variables were not significantly correlated to egoistic values. From all VBN variables, PN correlated strongest with food waste variables (*general food waste* (-.269, $p < .000$) and *wasting prepared food* (-.230, $p < .000$). This seems logic since PN is the variable closest to environmental behavior in VBN theory. Biospheric values correlated significantly high to food waste variables as well, although they are not closely related to behavior in VBN theory. It seems possible that people who value their

natural environment are less likely to waste food. A notable observation concerning AR is that all correlations with food waste variables were positive, which contradicts expectations. It seems uncommon for someone who has a high ascription of responsibility to waste more food. For all results of the correlation matrix see table 5.

Table 5 Pearson correlation

	Using a shopping list	Measuring food	Freezer fresh food	Freezer prepared food	General food waste	Wasting fresh food	Wasting prepared food	PN	AR	AC	NEP	Egoistic values	Altruistic values	Biospheric values
Using a shopping list	1 702	,265** .000 699	,222** .000 678	,136** .000 678	-,139** .000 678	-,106** .005 702	-,012 .743 702	,110** .004 702	,033 .380 702	,054 .154 702	,061 .104 702	-,095* .012 702	,062 .100 702	,126** .001 702
Measuring food		1 702	,078* .042 678	,072 .059 678	-,089* .018 702	-,044 .245 702	-,110** .003 702	,195** .000 702	,099** .009 702	,123** .001 702	,006 .880 702	,042 .267 702	-,007 .849 702	,075* .047 702
Freezer fresh food			1 682	,390** .000 682	-,072 .062 682	-,089* .021 682	,002 .949 682	,090* .019 682	,024 .538 682	,011 .767 682	,062 .104 682	-,053 .170 682	,051 .183 682	,079* .040 682
Freezer prepared food				1 682	-,103** .007 682	-,060 .117 682	-,117** .002 682	,080* .037 682	-,007 .857 682	,044 .253 682	,098* .011 682	-,061 .110 682	,051 .181 682	,069 .071 682
General food waste					1 706	,499** .000 706	,574** .000 706	-,269** .000 706	,197** .000 706	-,193** .000 706	-,113** .003 706	,098** .706	-,070 .009 706	-,251** .064 706
Wasting fresh food						1 706	,329** .000 706	-,181** .000 706	,082* .030 706	-,129** .001 706	-,057 .130 706	,054 .155 706	-,063 .092 706	-,195** .000 706
Wasting prepared food							1 706	,230** .000 706	,127** .001 706	-,167** .000 706	-,058 .126 706	,035 .351 706	-,023 .540 706	-,129** .001 706
PN								1 706	,369** .000 706	,505** .000 706	,289** .000 706	-,063 .094 706	,197** .000 706	,456** .000 706
AR									1 706	,327** .000 706	,201** .000 706	-,025 .512 706	,199** .000 706	,239** .000 706
AC										1 706	,421** .000 706	-,044 .245 706	,228** .000 706	,463** .000 706
NEP											1 706	-,127** .001 706	,112** .003 706	,427** .000 706
Egoistic												1 706	-,008 .842 706	-,120** .001 706
Altruistic													1 706	,467** .000 706
Biospheric														1 706

Note: **p<0.01, *p<0.05.

4.4 Multiple regression Analyses

4.4.1 Preceding behaviors explaining food waste

Table 6 Multiple regression analysis to test the effects of measuring food, using a shopping list and using a freezer for fresh and prepared food on wasting prepared food (DV)

DV: Wasting prepared food	β	t	p	R^2
Model 1:				.013
Measuring	-.06	-2.94	.003	
Model 2:				.013
Measuring	-.06	-3.01	.003	
Shopping list	.01	.67	.502	
Model 3:				.031
Measuring	-.06	-2.91	.000	
Shopping list	.01	.78	.004	
Freezer fresh food	.04	1.43	.433	
Freezer prepared food	-.08	-3.45	.151	

Table 7 Multiple regression analysis to test the effects of measuring food, using a shopping list and using a freezer for fresh and prepared food on wasting fresh food (DV)

DV: Wasting fresh food	β	t	p	R^2
Model 1:				.003
Measuring	-.03	-1.41	.157	
Model 2:				.012
Measuring	-.01	-.72	.467	
Shopping list	-.05	-2.47	.014	
Model 3:				.016
Measuring	-.01	-.67	.500	
Shopping list	-.04	-2.04	.041	
Freezer fresh food	-.03	-1.35	.175	
Freezer prepared food	-.01	-.49	.621	

Table 8 Multiple regression analysis to test the effects of measuring food, using a shopping list and using a freezer for fresh and prepared food on general food waste (DV)

DV: General food waste	β	t	p	R^2
Model 1:				.008
Measuring	-.04	-2.36	.018	
Model 2:				.022
Measuring	-.03	-1.50	.134	
Shopping list	-.06	-3.04	.002	
Model 3:				.030
Measuring	-.02	-1.40	.162	
Shopping list	-.05	-2.66	.008	
Freezer fresh food	-.00	-.20	.836	
Freezer prepared food	-.05	-2.13	.033	

The first set of three regression models analyzed to what extent preceding behaviors were able to explain food-wasting behaviors. Results showed that *using a shopping list* was the factor that contributed significantly most often, but weakly, in predicting all food-wasting behaviors in this study. It remained a significant measure throughout all three regression models (Table 6: $\beta = .01, p = .004$, Table 7: $\beta = -.04, p = 0.041$, Table 8: $\beta = -.05, p = 0.008$). It was able to predict *wasting fresh food* and *general food waste* the best. Notable was the positive β ($\beta = .01$) in the first regression analysis predicting *prepared food waste*. Although the result was very small, it was not expected that *using a shopping list* contributed to more prepared food being wasted. Furthermore, *measuring food* also contributes in predicting *wasting prepared food*. Although measures were weakly, it did show the highest influence on *wasting prepared food* (table 6) of all factors ($\beta = -.06$, for all models $p < 0.005$). Though, compared to *using a shopping list*, *measuring food* did not contribute significantly that much in the other models (table 7 and table 8). Surprisingly, *using a freezer for prepared food* was a significant contributor in predicting *general food waste*. This was the only time that freezer use contributed significantly in predicting food-wasting behaviors. Concluding, preceding behaviors scored lowest in *predicting fresh food*. *Wasting prepared food* was predicted better, mainly by *using a shopping list* and *measuring food* but β 's were low. Altogether, *general food waste* could be best predicted by preceding behaviors, with the largest significant contributors being *using a shopping list* and *using a freezer for prepared food*.

4.4.2 VBN variables explaining food waste

The second set of three multiple regression analyses measured to what extent values, beliefs and norms were able to explain food-wasting behaviors. It was chosen to exclude non-significant demographic data and confounders, since they would not add much to the model's explanatory power. The demographic variable *educational level* was not significant in any model and therefore excluded. Consequently, the first regression model, predicting *wasting prepared food*, excluded *education level* and age as well as both confounders. The second model, predicting *wasting fresh food*, excluded *educational level* and both confounders. The model predicting *general food waste* included all measures since they were significant. Please note that *wasting prepared food* and *wasting fresh food* were measured with a quantitative scale, whereas *general food waste* was measured with a Likert scale ranging from 'never' to 'always'. The different measurement scales could have influenced the explanation of variance in the three food-wasting behaviors.

Results of the first analysis showed that all variables together explained 12.6% of the variance in *wasting prepared food*. After the contribution in variance from AC in model 4, the variance in all models increased with only 1%. Moreover all predictors after AC were not significant, indicating that F-change was significant for models 1, 2, 3 and 4 only. PN realized the largest increase in variance in the regression analysis (5.5% in model 2). Furthermore, AR was a strong predictor as well ($\beta = .26, p < .001$), which is visible in model 3 where variance increased from 6.6% to 11.6%. Notable is that AR is a positive measure, which is in line with measured correlations. Furthermore, the variable gender did show a significant influence on the behavior *wasting prepared food* throughout the entire regression model (model 8: $\beta = .32, p = .006$). This indicated that women reported more *prepared food waste* than men. However, gender was not explained or influenced by VBN variables so the relation to food waste should be explored by future research. See table 9 for all results.

The second regression model (table 10) showed that 10.4% of the variance in *wasting fresh food* was explained. F-change was significant for model 1, 2, 3 and 8, meaning that AC, NEP, egoistic values and altruistic values had no significant contribution in this model. Age, gender, PN, AR and biospheric values were significant predictors of *wasting fresh food*. Similar to the first regression model, the variable gender indicated that women reported more food waste than men. Again, it is unclear how gender is related to food waste, which should be proved by future research. Negative β 's for age showed that older people waste less, however the variable did not contribute much in prediction *fresh food waste* since β 's were very small. PN caused 2.8% increase in the regression model. This was the highest increase throughout the model, which was also the case in the first regression model. A notable contrast to the first regression model is that AC is not significant at all, and that biospheric values ($\beta = -.08, p = .025$) in model 8 did show a significant measure. For all results, see table 10.

The third regression model (table 11) included *general food waste* as dependent variable. Confounding variables were added as well as age and gender because these variables had a significant contribution in all models. A total of 25.3% of the variance in *general food waste* could be explained, which is the most of all three regression analyses. F-change was significant for models 1, 2, 3, 4, 5 and 9. Again, NEP, egoistic values and altruistic values were not significant in any model. Similar to the first regression analysis, all models including the variables up till AC were significant, with PN contributing the most (8.4%) to variance in *general food waste*. In this regression analysis, gender, PN and AR had the strongest significant influence on general food waste. This model controlled for confounders grocery

shopping and cooking. Again, gender indicated that women wasted less food. See table 11 for all results.

An interesting result is that AR is a positive measure in all three regression models, whereas AC and PN are negative measures. It seems the higher one's personal norms and the more aware one is of the consequences of food waste, the less food is wasted. This is in line with VBN theory. For AR, however, the results say that the more responsible someone feels for wasting food, the more food is wasted, which contradicts VBN theory.

Table 9 Multiple regression analysis to test the effects of PN, AR, AC, NEP, values and gender on wasting prepared food (DV)

DV: Wasting prepared food	β	t	p	R^2
Model 1:				.009
Gender	.30	2.46	.014	
Model 2:				.066
Gender	.37	3.16	.002	
PN	-.27	-6.60	.000	
Model 3:				.116
Gender	.34	2.99	.003	
PN	-.38	-8.61	.000	
AR	.26	6.30	.000	
Model 4:				.125
Gender	.32	2.78	.005	
PN	-.32	-6.59	.000	
AR	.28	6.70	.000	
AC	-.13	-2.62	.009	
Model 5:				.125
Gender	.32	2.78	.006	
PN	-.32	-6.61	.000	
AR	.28	6.66	.000	
AC	-.13	-2.62	.009	
NEP	.00	.44	.660	
Model 6:				.126
Gender	.32	2.82	.005	
PN	-.32	-6.58	.000	
AR	.28	6.65	.000	
AC	-.13	-2.64	.008	
NEP	.00	.52	.598	
Egoistic values	.02	.79	.428	
Model 7:				.126
Gender	.32	2.81	.005	
PN	-.32	-6.65	.000	
AR	.28	6.61	.000	
AC	-.13	-2.61	.009	
NEP	.00	.52	.598	
Egoistic values	.02	.79	.428	
Altruistic values	-.00	-.06	.945	
Model 8:				.126
Gender	.32	2.77	.006	
PN	-.31	-6.18	.000	
AR	.27	6.59	.000	
AC	-.13	-2.48	.013	
NEP	.00	.65	.511	
Egoistic values	.01	.74	.459	
Altruistic values	.00	.16	.868	
Biospheric values	-.01	-.53	.595	

Note: DV = dependent variable; β is considered statistically significant if $p < .05$

Table 10 Multiple regression analysis to test the effects of PN, AR, AC, NEP, values, age and gender on wasting fresh food (DV)

DV: Wasting fresh food	β	t	p	R^2
Model 1:				.046
Age	-.01	-5.44	.000	
Gender	.20	1.75	.079	
Model 2:				.074
Age	-.01	-5.00	.000	
Gender	.26	2.25	.025	
PN	-.19	-4.64	.000	
Model 3:				.093
Age	-.01	-4.61	.000	
Gender	.25	2.14	.033	
PN	-.25	-5.77	.000	
AR	.16	3.82	.000	
Model 4:				.097
Age	-.01	-4.55	.000	
Gender	.23	2.01	.044	
PN	-.22	-4.48	.000	
AR	.17	4.07	.000	
AC	-.08	-1.66	.097	
Model 5:				.097
Age	-.01	-4.54	.000	
Gender	.23	2.01	.045	
PN	-.22	-4.46	.000	
AR	.17	4.06	.000	
AC	-.08	-1.55	.118	
NEP	-.00	-.05	.956	
Model 6:				.097
Age	-.01	-4.36	.000	
Gender	.23	2.03	.042	
PN	-.22	-4.45	.000	
AR	.17	4.06	.000	
AC	-.08	-1.56	.118	
NEP	.00	-.01	.990	
Egoistic values	.01	.36	.716	
Model 7:				.097
Age	-.01	-4.19	.000	
Gender	.24	2.06	.039	
PN	-.22	-4.43	.000	
AR	.17	4.10	.000	
AC	-.07	-1.48	.138	
NEP	.00	-.00	.993	
Egoistic values	.01	.39	.696	
Altruistic values	-.02	-.53	.595	
Model 8:				.104
Age	-.01	-3.57	.000	
Gender	.22	1.94	.053	
PN	-.19	-3.74	.000	
AR	.17	4.12	.000	
AC	-.05	-1.09	.275	
NEP	.00	.67	.503	
Egoistic values	.00	.29	.766	
Altruistic values	-.01	.41	.681	
Biospheric values	-.08	-2.24	.025	

Note: DV = dependent variable; β is considered statistically significant if $p < .05$

Table 11 Multiple regression analysis to test the effects of PN, AR, AC, NEP, values, demographic data and cooking and grocery shopping behavior on general food waste (DV)

DV: General food waste	β	t	p	R^2
Model 1:				.049
Age	-.01	-5.86	.000	
Gender	.11	1.00	.314	
Model 2:				.080
Age	-.01	-4.80	.000	
Gender	.28	2.43	.015	
Grocery shopping	.08	3.83	.000	
Cooking	-.08	-3.46	.001	
Model 3:				.145
Age	-.01	-4.18	.000	
Gender	.36	3.23	.001	
Grocery shopping	.08	3.98	.000	
Cooking	-.08	-3.66	.000	
PN	-.28	-7.29	.000	
Model 4:				.229
Age	-.00	-3.56	.000	
Gender	.32	2.96	.003	
Grocery shopping	.08	4.02	.000	
Cooking	-.07	-3.34	.001	
PN	-.40	-10.36	.000	
AR	.32	8.70	.000	
Model 5:				.241
Age	-.00	-3.48	.001	
Gender	.29	2.70	.007	
Grocery shopping	.08	4.09	.000	
Cooking	-.06	-3.19	.001	
PN	-.34	-7.93	.000	
AR	.34	9.23	.000	
AC	-.14	-3.37	.001	
Model 6:				.243
Age	-.00	-3.47	.001	
Gender	.29	2.73	.006	
Grocery shopping	.08	4.15	.000	
Cooking	-.06	-3.16	.002	
PN	-.34	-7.82	.000	
AR	.34	9.29	.000	
AC	-.13	-2.82	.005	
NEP	-.00	-1.18	.236	
Model 7:				.244
Age	-.00	-3.19	.001	
Gender	.30	2.77	.006	
Grocery shopping	.08	4.11	.000	
Cooking	-.06	-3.02	.003	
PN	-.34	-7.81	.000	
AR	.34	9.13	.000	
AC	-.13	-2.85	.004	
NEP	-.00	-1.05	.293	
Egoistic values	.03	1.09	.272	
Model 8:				.245
Age	-.00	-3.00	.003	
Gender	.30	2.82	.005	
Grocery shopping	.08	4.13	.000	
Cooking	-.06	-3.00	.003	
PN	-.34	-7.77	.000	
AR	.35	9.33	.000	
AC	-.12	-2.73	.006	
NEP	-.00	-1.04	.295	
Egoistic values	.03	1.14	.255	
Altruistic values	-.02	-.81	.418	
Model 9:				
Age	-.00	-2.40	.017	.252

Gender	.28	2.62	.009
Grocery shopping	.08	4.12	.000
Cooking	-.06	-2.74	.006
PN	-.31	-6.92	.000
AR	.35	9.40	.000
AC	-.10	-2.29	.022
NEP	-.00	-.24	.804
Egoistic values	.02	1.06	.286
Altruistic values	.00	.25	.799
Biospheric values	-.08	-2.49	.013

Note: DV = dependent variable; β is considered statistically significant if $p < .05$

5. Discussion

Statistics about food waste throughout the world are shockingly high. Approximately one third of all food gets wasted, which is not only unfair to all hungry people who are dying from malnutrition, it also negatively affects the economy, the environment and social standards and structures in society. To decrease the impact that food waste will eventually have on human kind, it is important to discuss this problem. The mechanisms that underlie food waste must be studied and understood. This study was one of the first to examine the predictive value of VBN theory in relation to food-wasting behaviors. The aim of this study was to explore food-wasting behaviors according to a person's values, beliefs and personal norms. In addition, in order to explore the complexity of food waste, this study examined how food waste could be explained from behaviors that precede food waste, the so-called *preceding behaviors*. Insights from this study can yield indications for practical interventions, which can hopefully contribute to decreasing food waste through behavior change. For examples of practical implications see section 5.2 of this chapter.

This study used three food waste outcome measures: *general food waste*, *wasting fresh food* and *wasting prepared food*. Of all three food-wasting behaviors, VBN theory explained most variance (25.2%) in *general food waste*. Especially PN, AR, AC and biospheric values contributed significantly to this. *Wasting prepared food* could be explained with 12.6%, mainly by VBN variables PN, AR, AC and furthermore gender. *Wasting fresh food* was explained the least by VBN variables. Only 10.4% was explained, mainly by PN, AR and gender. The use of different measurement scales could have caused differences in explained variance between the three food-wasting variables. *General food waste* was measured on a Likert scale ranging from 'never' to 'always', whereas *wasting prepared food* and *wasting fresh food* were measured on a quantitative scale. The question measuring *general food waste* was "How often do you usually waste food?", which asks for a general estimation of ones wasting behavior. Here, it is likely that respondents indicate a bigger amount of food waste than when precise numbers are asked for, as is the case for *wasting prepared- and fresh food*.

The predictive power of PN is recurring in every regression model, which is likely because PN is the most proximal item to behavior in VBN theory. The negative relation to food-wasting variables in this study indicated that higher personal norms are associated with less food being wasted. It can be an individual's conviction that wasting food is bad, possibly for many reasons, and therefore the individual does not waste food. Personal norms form guidelines and feelings of moral obligation not to waste food, which can differ for each individual. Personal norms to waste less/no food are activated by beliefs that environmental conditions threaten things a person values (AC) and that a person can act to reduce the threat (AR) (Stern, 2000). Thus, personal norms can be activated if someone knows the consequences of wasting food (e.g. more fossil fuels to transport food impacts climate change) (AC) and therefore acts upon these consequences by not wasting food (to reduce use of fossil fuels) (AR).

Because of the above, and since AR is the second proximal item to behavior in VBN theory, it seems an obvious large predictor in this study as well. The positive relation of food waste to AR was an unexpected result, because it implies that the more ascription of responsibility someone has, the more food waste he produces. The first possible explanation for this is that the reliability for the AR scale (.68) was satisfactory, but not good. However, since Steg and Jakovcevic (2013) incorporated scales with a similar reliability and since a confirmatory factor analysis also revealed strong correlations for the groupings AC, AR and PN in previous studies (Steg et al. 2005, Jakovcevic & Steg, 2013), this study chose to adopt the AR scale anyway.

Secondly, AR might possibly be interpreted differently by respondents. A statement in the questionnaire was: "I feel jointly responsible for the problems caused by food waste". One can disagree on this, because one does not feel responsible for the bigger food waste problem, despite the fact that one does waste food. In this case, the term 'responsibility' is doubtful: when did someone report feeling responsible for food waste? Another interpretation could have been that people, who feel responsible for the food waste problem, are more aware of their wasting-behaviors. Subsequently, they are more aware of the amount of food they waste and report that they feel responsible for this in the questionnaire. Reversely, people who do not feel responsible have possibly reported less food waste because they are unaware of their wasting-behaviors. Here, an important factor seems whether people are aware of their performed behavior, this should be taken into account when interpreting the results. Empirical evidence that might underpin the above findings comes from The Netherlands Nutrition Centre (2014). They propose that two-thirds of consumers is aware that they waste food,

especially elderly and women. However, at the same time, consumers underestimate their own wasting behavior and think others than themselves mainly cause the food waste problem (Voedingscentrum, 2014). Thus, research towards the self-awareness of behavior shows a discrepancy between reported and actual behavior.

AC explained *general food waste* and *wasting prepared food*, which was in line with expectations because AC is linked to AR in the causal chain. AC did not significantly add to the explanation of *wasting fresh food*, which was striking since it is in contrast to the results of the other two food-wasting behaviors. However, the significant results showed a negative relation to *general food waste* and *wasting prepared food* (i.e. Table 9, model 8: $\beta = -.13, p = .013$, Table 11, model 9: $\beta = -.10, p = .022$) in the regression analyses. This means that someone who is aware of the consequences of food waste is likely to waste less food. Possibly, people perform certain behavior based on their knowledge about consequences of food-wasting behavior. Knowing that a consequence of food waste is unnecessary CO₂ emission that impacts nature negatively, might be a reason to not perform food-wasting behaviors. Thus, when the consequences of food waste are clear, someone might act according to those consequences and thus not waste any food.

NEP, which represented beliefs about ones ecological environment, did not contribute significantly at all in all models. This is remarkable since ones environmental concern is likely to be related to practices such as reducing food waste. However, NEP is more distal to behavior than the previous items in the causal chain of VBN theory, which could possibly explain the non-significant measures. Furthermore, Anderson (2012) demonstrates some critique about the NEP scale that is mainly proposed by researches that have tried to link NEP scales to pro-environmental behaviors (as this study tries to do as well). These researchers have concerns about the validity of the scale; they suggest that the scale fails to measure a worldview accurately. It could therefore be that this study fails to link NEP to food waste. It could also be possible that people do not realize how food production can harm the environment and do not connect the problem and consequences of food waste to serious environmental issues. A third explanation could be that certain beliefs (i.e. ecological worldview) do not directly lead to behavior. For example, if someone believes he should care about preserving nature, this does not mean he acts this way and never wastes food.

Although NEP indicates a severance of the causal chain, biospheric values did show contribution in explaining food-wasting behaviors. In contrast to NEP that could not explain a relation between environmental concern and less food waste, the results about biospheric values confirmed the expectation that concern for natural environment (biospheric values)

adds to the explanation of food waste. Steg et al. (2005) give an explanation by proposing that the relationship between general values and behavior seems to be mediated by other factors like behavior specific beliefs or personal norms. Thus, biospheric values might be mediated by AC, AR and PN in this study, which are more proximal predictors of behavior. Biospheric values were negatively related to food waste items in the regression models, which indicated that people who care about their natural environment seem likely to waste less food. Although results were small, it was interesting that this study confirmed a relation between biospheric values and the reduction of *general food waste* and *wasting fresh food*. Furthermore, altruistic values and egoistic values did not support any food wasting behavior in regression models, which confirmed expectations. These results may imply that people who concern most about the self or others, are associated with low environmental concern.

This study also explored whether three preceding behaviors: *using a shopping list*, *measuring food* and *using a freezer*, were able to explain food-wasting behaviors. *Wasting prepared food* could be explained with 3.1% by the preceding behaviors. For *wasting fresh food* this was 1.6% and *general food waste* could be explained with 3.0%. Similar to the other regression models in this study, explanation of variance was lowest for *wasting fresh food*. The questionnaire gave a clear explanation of fresh food by giving examples (dairy products, fresh fruits, raw vegetables and meat). Possible is that people are likely to eat fresh food right away (e.g. an apple) which makes wasting less apparent. Another possibility is that fresh food can be stored for a longer period before decaying, than prepared food can. However, these explanations are assumptions and were not studied in this study so a definitive answer to this remark cannot be given.

Because overall effects of preceding behaviors were small, this study was only to a limited extent able to explain food wasting-behaviors from preceding behaviors. Results showed that the predictor *measuring food* contributed the most in explaining less *prepared food* being wasted. This finding was expected, since carefully measuring the amount of food is likely to lead to adequate portions and thus no or less prepared food waste after dinner. *Measuring food* did not contribute in explaining other wasting behaviors significantly. *Using a freezer to store prepared food* only contributed in explaining *general food waste*. Other measures for freezer use were not significant, meaning that its contribution to less food waste is very small. *Using a shopping list* contributed most significantly in explaining food-wasting behaviors. Probably, planned shopping contributes to less food waste because people are aware of what food is needed and are likely to buy this more purposefully with a shopping list. This corresponds with findings of Quested et al. (2013) who found that i.e. the use of a

shopping list caused a positive change in behavior relating to household food waste. This can be an indicator for future research towards preceding behaviors of food waste, such as *using a shopping list*, in the Netherlands.

Due to a lack of theoretical evidence about using confounders in research towards food waste, this study included the confounders grocery shopping and cooking, based on logical reasoning. It was reasoned that the frequency someone shops for groceries or cooks dinner could influence the amount of food waste that was generated. However, this assumption was overturned by results of this study. The model that explained *general food waste* controlled for grocery shopping and cooking, meaning that these confounders did not influence the explanatory power of VBN variables. Moreover, confounders were not significant in explaining *wasting fresh and prepared food*. Thus, not even a relation between these food-wasting variables and confounders was found. Altogether this meant that grocery shopping and cooking were not interfering the explanation of food-wasting behaviors in this study.

The literature review towards food waste emphasized that understanding the complexity of food waste is difficult. Stern (2000, p.16), who is one of the founders of VBN theory, emphasizes this by stating: “environmentally significant behavior is dauntingly complex, both in its variety and in the causal influences on it.” There have only been few empirical studies that focus on explaining the core of household food-wasting behaviors. Additionally, there is a lack of studies that use predefined measurement scales that can strengthen the possibility to explain food-wasting behaviors. Thus, the food waste area is relatively new and still to be explored by more research.

As an alternative to study food waste in a structured and empirical manner, this study used VBN theory, which focuses on pro-environmental behavior. In this study, pro-environmental behavior was linked to less food being wasted. A study that was done by Steg and Jakovcevic (2013) used VBN theory to explain intention to reduce car use. Somewhat similar results were found in the variance of behavior. The current study could explain 25.2% variance in *general food waste* whereas Steg and Jakovcevic found that all VBN items explained 22% of the variance in intention to reduce car use. Furthermore, Steg et al. (2005) found that VBN variables explained 35% of the variance in the acceptability of energy policies, which is clearly higher than the current study. Both studies included non-significant measures of VBN items in these results.

VBN theory seems to differ for different behavior domains. Steg et al. (2005) suggest that this may depend on how costly it is for an individual in terms of money, effort and time,

to act pro-environmentally. “Relatively costly behavior, for example the use of a car or subway, is less strongly related to personal norms than is less costly behavior, such as recycling waste.” (Steg et al., 2005). However, it is not clear how the above tested behaviors differ in terms of effort, as well as it did not become clear in this study how costly food-wasting behaviors are.

Furthermore, this study observed some similar as well as contradicting results concerning value orientations in studies of Steg et al. (2005) and Steg and Jakovcevic (2013). The current study did not show a significant relation between altruistic values and food waste, just as Steg et al. (2005) did not measure significant altruistic values either. Steg and Jakovcevic (2013) did find significant relations. Differences might depend on the measured behavior in each study. Steg and Jakovcevic (2013) did a study towards reduction of car use. It is obvious that less car use can contribute to a cleaner environment (less gas emission) and thus a healthier life. This might appeal to ones altruistic values because it enhances living conditions of a person and his relatives. Food waste or energy policies (Steg et al., 2005) have less obvious negative consequences for a person and his (social) environment. This might possibly explain non-significant measures in the study of Steg et al. (2005) and this study. Moreover, the findings on altruistic values in this study contradict Stern (2000, p.7) who states that “people who value other species highly will be concerned about environmental conditions that threaten those valued objects, just as altruists who care about other people will be concerned about environmental conditions that threaten the other people’s health or well-being”.

5.1 Limitations and future research

A strength of the present study is that food waste is studied by means of VBN theory, which is possibly one of the first times this was done in the Netherlands. Furthermore, this study was theory based and investigated the complexity of food waste in a large sample ($N = 706$). However, the findings of this study should be interpreted with care since this study has some limitations as well.

First, this study was cross-sectional because all data were generated at one point in time. Therefore, it was not possible to see development in behaviors of respondents, which made it unable to indicate causal relations between predictor variables and outcome variables in this study. Reversed causality cannot be precluded in a cross-sectional study, which might be the case for all relations found. For example, the positive relation of AR to food waste in this study. It is unclear whether people who have a high sense of responsibility for the food

waste problem (AR) scored high in the questionnaire, or whether people who waste much food reported high AR in the questionnaire. Thus, it seems to remain unclear whether much food waste or much sense of responsibility caused the positive relation to food waste in this study.

This study used a questionnaire to investigate food waste in households. This method was chosen because VBN theory is mainly tested in a quantitative manner and predefined and tested measurement scales could be used. Although using a questionnaire has many benefits (e.g. measuring quantities, convenient for respondents, wide reach), a recommendation would be to complement this with conducting interviews. A researcher is able to identify motives, thoughts and feelings through the act of interviewing. Asking questions and being able to ask follow-up questions creates a more in depth and profound vision on why people waste food. Future research could also think about combining questionnaires and/or interviews with observing food-wasting behaviors of people, or diary studies. However, these methods have its downsides as well. For example, respondents changing original behavior to more pro-environmental behavior when being observed, or under reporting in waste diaries. An effective combination of methods should be thought through by future researchers.

VBN theory focuses on the individual only and leaves out the environment or context, despite the fact that individuals interact with their environment. This can be seen as a limitation of the theory. Motives, for example friends, available time, attitude, intention, could also influence food-wasting behavior. The absence of such factors in this study could be an explanation of why variance was not very high for explaining food-wasting behaviors. However, since investigating each detail of behavior as a whole within one study is impossible, VBN theory seems suitable in a study focusing on specific individual behaviors.

Nevertheless, future research towards food waste could focus more on context and/or using other behavioral theories. For example, the Theory of Planned Behavior (TPB) by Ajzen (1991). This theory could give more insight in how subjective norms, and the ability to perform certain behavior could influence and/or constitute food-wasting behaviors. Especially the latter seems interesting because food-wasting behaviors are multidimensional which might make it uneasy for a person not to waste food. Insight on peoples perceived ability to not waste food could clarify insights about pitfalls and incentives that lead to food waste. In line with this, the Social Cognitive Theory highlights the importance of self-efficacy: whether people think they are able to perform a certain behavior or not (Bartholomew, 2011). Again, it might be interesting and useful to investigate to what extent people feel that they are able to waste nothing.

Additionally, The Ecological Systems Theory of Urie Bronfenbrenner (1979) could reveal more about how a person interacts with its environment and how this influences food-wasting behavior. Bronfenbrenner states the importance of the interaction between individuals and systems (which can be seen as clusters of environmental factors) consisting beyond the individual, for example family, (social) media and laws. Incorporating these external factors in a study can give an idea about which external factors prohibit or stimulate food-wasting behaviors.

The presence of these alternative studies emphasizes that VBN theory covers one small piece of behavioral research in a wide range of social-psychological theories. VBN focuses mainly on environmental values, beliefs and norms of the individual, revealing personal motivations of food-wasting behavior. This gave more insight in which individual factors underlie food waste, however it would be interesting to study an individuals context as well, which should be considered by future researchers who study food-wasting behaviors.

Another limitation regards the sample of the current study. Some bias may have occurred as a consequence of recruiting several respondents from the Facebook page of the Netherlands Nutrition Centre, where food is the main point of focus. Such respondents may have had a prior interest in food and food waste, which could have influenced their answers. It would be valuable if future research towards food-wasting behaviors includes all layers of society in its sample. A balanced mix of gender, age, educational-level and cultures gives a more honest idea of how food-wasting behaviors are formed throughout society.

Furthermore, this study had an unequal male/female ratio. 89% of the respondents was female and only 11% was male. It is unclear why much more females responded. Perhaps they felt more attracted to the topic ‘grocery shopping and cooking’ of the survey request. Another assumption is that females cook and shop more often and therefore were attracted to the survey. Thirdly, it is likely that more females responded since Netherlands Nutrition Centre has more female followers. Results should not be generalized and should be interpreted with care. Future research should strive for a better gender ratio to create a representative sample. Furthermore this study was not able to study whether females and males are related differently to food waste. Future researchers can make a distinction between the sexes to be able to explain if and how gender influences differences in food-wasting behaviors. A convenient example for doing this is conducting a T-test in SPSS where males and females can be separated.

The questionnaire also required respondents to estimate frequencies of behaviors they performed in the past week or usually. It is possible that some respondents were not able to

estimate their behavior accurately (i.e. memory bias). Additionally, it might be confronting to think about the times one wasted food in one week. This can lead to a lower indication of food waste (i.e. socially desirable answers) in the questionnaire, which resulted in a lower explanation in variance for *wasting prepared- and fresh food*. Therefore, results of the survey may differ from actual performed behavior. It may be preferable that future research focuses on validating behavioral measures for food waste. It would be lucrative when different studies can be done with the same measurements. This can accelerate the search towards underlying mechanisms of food waste in different countries, cultures and settings, resulting in better indicators for interventions that aim at reducing food waste. As far as known, currently there are no accepted or standard measures that monitor food waste in households yet, and each of the existing methods has its limitations.

Lastly, this study experienced some indistinctness from respondents who asked what exactly was considered food waste (i.e. also one last bite of food on the plate?) and it became clear it was interpreted differently sometimes. Thus, to be sure everyone interprets food waste similarly and to be sure it is seen as pro-environmental in studies using VBN, future research should define food waste more extensively than this study did in its questionnaire.

5.2 Practical implications

Developing interventions that will help households to reduce food waste is difficult since wasting behaviors within households vary greatly depending on the reasons such food waste is generated. Besides, food waste consists of multiple determinants that makes targeting food waste through an intervention challenging. Consequently, multiple interventions could target different practices and behaviors concerning food waste that contribute in the reduction of food waste. However, some suggestions can be derived from this study, though the following suggestions are not comprehensive and there are many other activities that can contribute to the reduction of food waste.

Using a shopping list, measuring food and using a freezer did not explain food waste very strongly in this study, however those preceding behaviors contributed slightly in decreasing food waste. Therefore it could be promoted to consumers to use a shopping list and measure food for a meal. Tools should be promoted that make performing such behavior as easy and effortless as possible, this can increase the chance of success. A possible example can be an application (app) for mobile phones that is programmed according to shopping habits of an individual. For example, it can send reminders (push-messages) on days that someone shops for groceries and easily gives access to a tool that helps making a shopping

list. Another example is providing measuring tools at accessible places such as supermarkets or on the Internet. The Netherlands Nutrition Centre provided one million measuring cups for free in supermarkets when consumers bought paste or rice (Netherlands Nutrition Centre, 2013). The benefits of using this cup were also promoted on (social) media. Such interventions can contribute in stimulating people to prepare meals more consciously, which can contribute to the reduction of food waste. Possibly, such intervention tools must be easily accessible and effortless in order to appeal to adopt such (new) behaviors.

It seems promising to focus interventions especially on norms, beliefs and biospheric values, since the results of this study suggest that they contributed to the reduction of food waste. Interventions should especially focus on influencing personal norms, since PN appeared to be the strongest predictor for food-wasting behaviors in this study. To do so, it can be effective to influence AC and AR in interventions, because those factors might strengthen ones personal norms (PN) in the causal chain of VBN theory.

Stern (2000) states that VBN theory presupposes that the consequences that matter in activating personal norms are adverse consequences to whatever the individual values. This assumes that in order to target personal norms in interventions, the consequences that are disadvantageous for a person should be clear (AC) and also how this person can act to reduce or avoid these consequences (AR). Contributing to this, Stern (2000) states that by influencing public policies, the effects of food waste reduction may be large, because public policies can change the behaviors of many people and organizations at once. Food waste could for example be targeted through implementing a new policy that requires people legally to pay for their produced waste. Similar to the collection of regular household waste in the Netherlands, people would have to present their household food waste but than pay for it per kilo. This could be an incentive of which the disadvantages are clear, namely losing money to food waste (AC), and of which it is also clear how people can act to reduce these disadvantages (AR), namely not wasting food. Please note that this is an example of which it is unclear whether such laws are ethically and legally possible to implement, however it is supposed that changing external factors may be effective in changing food-wasting behaviors.

Another example of adjusting external factors in order to change food-wasting behaviors is a policy that sets new rules for companies to produce smaller packages. This makes it likely that consumers waste less because they do not have to buy too much food. Also, best-before-dates on products could be expanded since currently this increases food illness risk perceptions, while most of the time food is still good and edible. These are examples of changing external factors (present in people's environment), which seem

effective in changing people's behaviors.

Stern et al. (1995) suggest that people might waste less food when they are affected by findings of environmental science about consequences (AC) and publicity about the subject. An example of such publicity, which might appeal to ones AC, comes from the FAO (2013), who spread an article with the headline: "Food waste harms climate, water, land and biodiversity" completed with a sub-headline pointing at "direct economic costs of \$750 billion annually". Publicity of this kind might be able to activate people's thoughts about negative consequences of food waste, resulting in less performed food waste. It might be appealing to a wider public when such publicity about consequences of food waste is communicated through regular media channels (i.e. daily news) because they have are more objective character. Organizations that fight food waste are likely have a "greener" character that might not appeal to everyone. Future research should prove whether these assumptions are right. Moreover, in order to appeal to ones personal norms, future research should focus on how persuasive communication can impact people's feelings and ideas about food waste and how it can help to reduce wasting-behaviors.

Furthermore Stern et al. (1995) suggest that people might waste less when they experience perceived openness of the political system to public influence (appealing to ones AR). An example of this can be a (activistic) campaign where people get engaged in the issue of food waste and can demonstrate their sense of responsibility (AR). A campaign that works together with governments is The Love Food Hate Waste (LFHW) campaign in the UK. LFHW was launched to create more awareness about the problem, to highlight benefits of reducing the amount of thrown away food and create the personal conviction to act (Quested, 2013). Such campaign can also be launched in the Netherlands to create more awareness of the problem and to function as platform and/or voice that provide guidelines and tools that activate people in reducing food waste. Following Stern et al. (1995), it would be even better when Dutch government and politics are open to such campaign and perhaps collaborate in it. The Dutch Ministry of Economic Affairs created an initiative that wants to reduce food waste: "No Waste Network" (NWN). NWN aims at entrepreneurs and institutions in the food chain (NWN, 2014). So unfortunately households are not a part of this campaign. However, a government that is already involved in food waste might support campaigning by consumers and/or households as well.

It has become clear that Stern (2000) states that personal norms can be influenced by information that shapes AC and AR beliefs. Since biospheric values contributed to the explanation of food waste as well, it might help to include facts about how food waste harms

the environment in messages that can be communicated to society (i.e. “Wasting twice a day, means throwing 5 liters of water away”). It might also be helpful when such messages have a personal character: how can food waste affect (the environment of) an individual/household or how can saving food contribute to an individual’s wellbeing. Such messages could contain useful information and/or instructions on how to judge whether food is still good despite passing the best-before-date (e.g. give an accurate description or checklist of how decayed milk smells or looks, and promote that if it does not resembles the description it is still fresh enough to consume). This can be spread on social media, or municipality or food authority websites who have a trustworthy image.

5.3 Conclusions

This study showed that personal norms were the strongest predictor for reducing food waste of all variables in VBN theory. Focusing interventions on maintaining and influencing personal norms of people seems therefore promising in establishing behavioral change in terms of food waste reduction. This study proposed that it seems profitable to intervene on PN by influencing AC and AR because these variables form a coherent causal chain towards pro-environmental behavior. Furthermore, this study was to a limited extent able to explain food waste according to preceding behaviors such as *using a shopping list, measuring food* and *using a freezer*. The small contribution could open a window of opportunity for further research towards the role of these preceding behaviors in food waste reduction.

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Appendix: questionnaire

Beste deelnemer,

Hartelijk dank voor uw interesse in deze enquête! Deze vragenlijst gaat over boodschappen doen en koken.

Deze enquête wordt afgenoem door Marlieke Penninx, student van Wageningen University, als onderdeel van haar masterthesis onder begeleiding van dr. B. C. Mulder van de leerstoelgroep Strategische Communicatie en prof. dr. ir. P. van 't Veer van de leerstoelgroep Humane Voeding.

Vul deze vragenlijst op een rustige plek in zonder met anderen te overleggen. Het is erg belangrijk dat u de vragen eerlijk beantwoordt en de hele vragenlijst in één keer invult. Invullen duurt ongeveer tien minuten.

Uw antwoorden worden anoniem verwerkt. Als dank worden vier bol.com bonnen ter waarde van 10 euro verloot!

Alvast bedankt voor uw deelname!

Hieronder staan 13 waarden. Achter elke waarde wordt een korte toelichting gegeven over de betekenis van de waarde. Uw scores kunnen variëren van -1 tot 7.

-1 betekent dat de waarde **ingaat tegen uw principes**

7 betekent dat de waarde **uiterst belangrijk** voor u is als leidraad in uw leven.

Hoe **hoger** het cijfer hoe **belangrijker** de waarde is als leidraad in uw leven.

Probeer zoveel mogelijk **onderscheid** te maken tussen het belang van de waarden door **verschillende cijfers** aan te kruisen.

Gewoonlijk heeft iemand niet meer dan **twee** waarden waar aan een **7** toegekend wordt.

Wilt u aangeven hoe belangrijk elke waarde is voor u als leidraad in uw leven?

	Gaat tegen mijn principes in	Niet belangrijk	Belangrijk				Zeer belangrijk	Uiterst belangrijk	
	-1	0	1	2	3	4	5	6	7
andere mensen, dominantie	controle over andere mensen, dominantie Gaat tegen mijn principes in -1	controle over andere mensen, dominantie Niet belangrijk 0	controle over andere mensen, dominantie 1	controle over andere mensen, dominantie 2	controle over andere mensen, dominantie Belangrijk 3	controle over andere mensen, dominantie 4	controle over andere mensen, dominantie 5	controle over andere mensen, dominantie Zeer belangrijk 6	controle over andere mensen, dominantie Uiterst belangrijk 7
4. EENHEID MET DE NATUUR: je verbonden voelen met de natuur	4. EENHEID MET DE NATUUR : je verbonden voelen met de natuur Gaat tegen mijn principes in -1	4. EENHEID MET DE NATUUR : je verbonden voelen met de natuur Niet belangrijk 0	4. EENHEID MET DE NATUUR : je verbonden voelen met de natuur 1	4. EENHEID MET DE NATUUR : je verbonden voelen met de natuur 2	4. EENHEID MET DE NATUUR : je verbonden voelen met de natuur Belangrijk 3	4. EENHEID MET DE NATUUR : je verbonden voelen met de natuur 4	4. EENHEID MET DE NATUUR : je verbonden voelen met de natuur 5	4. EENHEID MET DE NATUUR : je verbonden voelen met de natuur Zeer belangrijk 6	4. EENHEID MET DE NATUUR : je verbonden voelen met de natuur Uiterst belangrijk 7
5. EEN VREEDZAME WERELD: vrij van oorlog en conflict	5. EEN VREEDZAME WERELD : vrij van oorlog en conflict Gaat tegen mijn principes in -1	5. EEN VREEDZAME WERELD : vrij van oorlog en conflict Niet belangrijk 0	5. EEN VREEDZAME WERELD : vrij van oorlog en conflict 1	5. EEN VREEDZAME WERELD : vrij van oorlog en conflict 2	5. EEN VREEDZAME WERELD : vrij van oorlog en conflict Belangrijk 3	5. EEN VREEDZAME WERELD : vrij van oorlog en conflict 4	5. EEN VREEDZAME WERELD : vrij van oorlog en conflict 5	5. EEN VREEDZAME WERELD : vrij van oorlog en conflict Zeer belangrijk 6	5. EEN VREEDZAME WERELD : vrij van oorlog en conflict Uiterst belangrijk 7
6. RIJKDOM: materiële bezittingen, geld	6. RIJKDOM : materiële bezittingen, geld Gaat tegen mijn principes in -1	6. RIJKDOM : materiële bezittingen, geld Niet belangrijk 0	6. RIJKDOM : materiële bezittingen, geld 1	6. RIJKDOM : materiële bezittingen, geld 2	6. RIJKDOM : materiële bezittingen, geld Belangrijk 3	6. RIJKDOM : materiële bezittingen, geld 4	6. RIJKDOM : materiële bezittingen, geld 5	6. RIJKDOM : materiële bezittingen, geld Zeer belangrijk 6	6. RIJKDOM : materiële bezittingen, geld Uiterst belangrijk 7

Gaat tegen mijn principes in	Niet belangrijk		Belangrijk				Zeer belangrijk		Uiterst belangrijk
	-1	0	1	2	3	4	5	6	7
eerzuchtig, strevend Gaat tegen mijn principes in -1	eerzuchtig, strevend Niet belangrijk 0	eerzuchtig, strevend 1	eerzuchtig, strevend 2	eerzuchtig, strevend Belangrijk 3	eerzuchtig, strevend 4	eerzuchtig, strevend 5	eerzuchtig, strevend Zeer belangrijk 6	eerzuchtig, strevend Uiterst belangrijk 7	

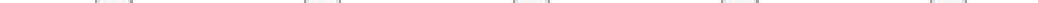
Hoe vaak per week doet u meestal boodschappen?

- Ik doe nooit boodschappen
 - 1 keer
 - 2 keer
 - 3 keer
 - 4 keer
 - 5 keer
 - 6 keer
 - 7 keer
 - Meer dan 7 keer

Hoe vaak hebt u het idee meer te kopen dan dat u eigenlijk nodig hebt?

Hoe vaak gebruikt u een boodschappenlijstje als u boodschappen voor uw eten doet?

Nooit Bijna nooit Soms Regelmatig Vaak Meestal Altijd



Hoe vaak koopt u meer boodschappen dan op uw boodschappenlijstje staan?

Nooit Bijna nooit Soms Regelmatig Vaak Meestal Altijd

Hoe vaak per week kookt u meestal?

- Ik kook nooit
 - 1 keer
 - 2 keer
 - 3 keer
 - 4 keer
 - 5 keer
 - 6 keer
 - 7 keer

Om op maat te koken kunt u bijvoorbeeld een keukenweegschaal, kopje of een maatbeker gebruiken. Hiermee kunt u de precieze hoeveelheid van een ingrediënt afwegen of afmeten op basis van het aantal eters. (Denk aan rijst of pasta, maar ook groenten)

Hoe vaak weegt of meet u het eten dat u kookt af op het aantal personen dat mee eet? Bijvoorbeeld met een maatbeker of een weegschaal?

Nooit

Bijna nooit

Soms

Regelmäßig

Vaal

Meesta

Altij

Hoe vaak houdt u eten over als u zelf heeft gekookt?

Nooit

Bijna nooit

Soms

Regelmäßig

Vaal

Meesta

Altij

Heeft u thuis een diepvries?

- Ja
 Nee

Hoe vaak gebruikt u deze diepvries om verse producten in te bewaren zodat ze langer goed blijven? (Denk aan vlees, brood of groenten)

- Nooit Bijna nooit Soms Regelmatig Vaak Meestal Altijd
-

Hoe vaak gebruikt u deze diepvries om bereid(e) eten(srestjes) in te bewaren?

- Nooit Bijna nooit Soms Regelmatig Vaak Meestal Altijd
-

Hoe vaak moet u eten weggooien omdat het te lang in de diepvries heeft gelegen?

- Nooit Bijna nooit Soms Regelmatig Vaak Meestal Altijd
-

Welke soort diepvries heeft u thuis tot uw beschikking? Graag soort en aantal aangeven. (Meerdere antwoorden mogelijk)



Hoe vaak gooit u gewoonlijk eten weg?

Nooit



Bijna nooit



Soms



Regelmatig



Vaak



Meestal



Altijd



Hoe vaak heeft u de afgelopen week in totaal vers eten weggegooid? (Bijvoorbeeld zuivel, vers fruit of ongekookte groenten, rauw vlees of vleeswaar, etc.)

Nooit

1 keer

2 keer

3 keer

4 keer

5 keer

6 keer

7 keer

Meer dan 7 keer

Hoe vaak heeft u de afgelopen week in totaal bereid eten weggegooid? (Bijvoorbeeld warm eten zoals gekookte aardappelen, groenten of gebakken vlees, etc.)

Nooit

1 keer

2 keer

3 keer

4 keer

5 keer

6 keer

7 keer

Meer dan 7 keer

In hoeverre bent u het eens met de volgende stellingen?

	Helemaal mee oneens	Mee oneens	Een beetje mee oneens	Niet mee oneens/niet mee eens	Een beetje mee eens	Mee eens	Helemaal mee eens
1. Mensen zoals ik zouden moeten doen wat we kunnen om zo weinig mogelijk voedsel weg te gooien.	<input type="radio"/> 1. Mensen zoals ik zouden moeten doen wat we kunnen om zo weinig mogelijk voedsel weg te gooien. Helemaal mee oneens	<input type="radio"/> 1. Mensen zoals ik zouden moeten doen wat we kunnen om zo weinig mogelijk voedsel weg te gooien. Mee oneens	<input type="radio"/> 1. Mensen zoals ik zouden moeten doen wat we kunnen om zo weinig mogelijk voedsel weg te gooien. Een beetje mee oneens	<input type="radio"/> 1. Mensen zoals ik zouden moeten doen wat we kunnen om zo weinig mogelijk voedsel weg te gooien. Niet mee oneens/niet mee eens	<input type="radio"/> 1. Mensen zoals ik zouden moeten doen wat we kunnen om zo weinig mogelijk voedsel weg te gooien. Een beetje mee eens	<input type="radio"/> 1. Mensen zoals ik zouden moeten doen wat we kunnen om zo weinig mogelijk voedsel weg te gooien. Mee eens	<input type="radio"/> 1. Mensen zoals ik zouden moeten doen wat we kunnen om zo weinig mogelijk voedsel weg te gooien. Helemaal mee eens
2. Ik voel me moreel verplicht om zuinig met voedsel om te gaan, ongeacht wat anderen doen.	<input type="radio"/> 2. Ik voel me moreel verplicht om zuinig met voedsel om te gaan, ongeacht wat anderen doen. Helemaal mee oneens	<input type="radio"/> 2. Ik voel me moreel verplicht om zuinig met voedsel om te gaan, ongeacht wat anderen doen. Mee oneens	<input type="radio"/> 2. Ik voel me moreel verplicht om zuinig met voedsel om te gaan, ongeacht wat anderen doen. Een beetje mee oneens	<input type="radio"/> 2. Ik voel me moreel verplicht om zuinig met voedsel om te gaan, ongeacht wat anderen doen. Niet mee oneens/niet mee eens	<input type="radio"/> 2. Ik voel me moreel verplicht om zuinig met voedsel om te gaan, ongeacht wat anderen doen. Een beetje mee eens	<input type="radio"/> 2. Ik voel me moreel verplicht om zuinig met voedsel om te gaan, ongeacht wat anderen doen. Mee eens	<input type="radio"/> 2. Ik voel me moreel verplicht om zuinig met voedsel om te gaan, ongeacht wat anderen doen. Helemaal mee eens
3. Ik voel me persoonlijk verplicht om zo weinig mogelijk voedsel weg te gooien.	<input type="radio"/> 3. Ik voel me persoonlijk verplicht om zo weinig mogelijk voedsel weg te gooien. Helemaal mee oneens	<input type="radio"/> 3. Ik voel me persoonlijk verplicht om zo weinig mogelijk voedsel weg te gooien. Mee oneens	<input type="radio"/> 3. Ik voel me persoonlijk verplicht om zo weinig mogelijk voedsel weg te gooien. Een beetje mee oneens	<input type="radio"/> 3. Ik voel me persoonlijk verplicht om zo weinig mogelijk voedsel weg te gooien. Niet mee oneens/niet mee eens	<input type="radio"/> 3. Ik voel me persoonlijk verplicht om zo weinig mogelijk voedsel weg te gooien. Een beetje mee eens	<input type="radio"/> 3. Ik voel me persoonlijk verplicht om zo weinig mogelijk voedsel weg te gooien. Mee eens	<input type="radio"/> 3. Ik voel me persoonlijk verplicht om zo weinig mogelijk voedsel weg te gooien. Helemaal mee eens

	Helemaal mee oneens	Mee oneens	Een beetje mee oneens	Niet mee oneens/niet mee eens	Een beetje mee eens	Mee eens	Helemaal mee eens
4. Ik zou een beter mens zijn als ik geen voedsel weg gooi.	<input type="radio"/> 4. Ik zou een beter mens zijn als ik geen voedsel weg gooi. Helemaal mee oneens	<input type="radio"/> 4. Ik zou een beter mens zijn als ik geen voedsel weg gooi. Mee oneens	<input type="radio"/> 4. Ik zou een beter mens zijn als ik geen voedsel weg gooi. Een beetje mee oneens	<input type="radio"/> 4. Ik zou een beter mens zijn als ik geen voedsel weg gooi. Niet mee oneens/niet mee eens	<input type="radio"/> 4. Ik zou een beter mens zijn als ik geen voedsel weg gooi. Een beetje mee eens	<input type="radio"/> 4. Ik zou een beter mens zijn als ik geen voedsel weg gooi. Mee eens	<input type="radio"/> 4. Ik zou een beter mens zijn als ik geen voedsel weg gooi. Helemaal mee eens
5. Ik voel me in mijn dagelijks gedrag verplicht om rekening te houden met het milieu en de natuur.	<input type="radio"/> 5. Ik voel me in mijn dagelijks gedrag verplicht om rekening te houden met het milieu en de natuur. Helemaal mee oneens	<input type="radio"/> 5. Ik voel me in mijn dagelijks gedrag verplicht om rekening te houden met het milieu en de natuur. Mee oneens	<input type="radio"/> 5. Ik voel me in mijn dagelijks gedrag verplicht om rekening te houden met het milieu en de natuur. Een beetje mee oneens	<input type="radio"/> 5. Ik voel me in mijn dagelijks gedrag verplicht om rekening te houden met het milieu en de natuur. Niet mee oneens/niet mee eens	<input type="radio"/> 5. Ik voel me in mijn dagelijks gedrag verplicht om rekening te houden met het milieu en de natuur. Een beetje mee eens	<input type="radio"/> 5. Ik voel me in mijn dagelijks gedrag verplicht om rekening te houden met het milieu en de natuur. Mee eens	<input type="radio"/> 5. Ik voel me in mijn dagelijks gedrag verplicht om rekening te houden met het milieu en de natuur. Helemaal mee eens
6. Ik voel me schuldig als ik voedsel weggooi.	<input type="radio"/> 6. Ik voel me schuldig als ik voedsel weggooi. Helemaal mee oneens	<input type="radio"/> 6. Ik voel me schuldig als ik voedsel weggooi. Mee oneens	<input type="radio"/> 6. Ik voel me schuldig als ik voedsel weggooi. Een beetje mee oneens	<input type="radio"/> 6. Ik voel me schuldig als ik voedsel weggooi. Niet mee oneens/niet mee eens	<input type="radio"/> 6. Ik voel me schuldig als ik voedsel weggooi. Een beetje mee eens	<input type="radio"/> 6. Ik voel me schuldig als ik voedsel weggooi. Mee eens	<input type="radio"/> 6. Ik voel me schuldig als ik voedsel weggooi. Helemaal mee eens

In hoeverre bent u het eens met de volgende stellingen?

	Helemaal mee oneens	Mee oneens	Een beetje mee oneens	Niet mee oneens/niet mee eens	Een beetje mee eens	Mee eens	Helemaal mee eens
1. Ik voel me medeverantwoordelijk voor het weggooien van voedsel. Helemaal mee oneens	<input checked="" type="radio"/> 1. Ik voel me medeverantwoordelijk voor het weggooien van voedsel. Helemaal mee oneens	<input checked="" type="radio"/> 1. Ik voel me medeverantwoordelijk voor het weggooien van voedsel. Mee oneens	<input checked="" type="radio"/> 1. Ik voel me medeverantwoordelijk voor het weggooien van voedsel. Een beetje mee oneens	<input checked="" type="radio"/> 1. Ik voel me medeverantwoordelijk voor het weggooien van voedsel. Niet mee oneens/niet mee eens	<input checked="" type="radio"/> 1. Ik voel me medeverantwoordelijk voor het weggooien van voedsel. Een beetje mee eens	<input checked="" type="radio"/> 1. Ik voel me medeverantwoordelijk voor het weggooien van voedsel. Mee eens	<input checked="" type="radio"/> 1. Ik voel me medeverantwoordelijk voor het weggooien van voedsel. Helemaal mee eens
2. Niet alleen de overheid en de industrie zijn verantwoordelijk voor voedselverspilling, maar ook ikzelf. Helemaal mee oneens	<input checked="" type="radio"/> 2. Niet alleen de overheid en de industrie zijn verantwoordelijk voor voedselverspilling, maar ook ikzelf. Helemaal mee oneens	<input checked="" type="radio"/> 2. Niet alleen de overheid en de industrie zijn verantwoordelijk voor voedselverspilling, maar ook ikzelf. Mee oneens	<input checked="" type="radio"/> 2. Niet alleen de overheid en de industrie zijn verantwoordelijk voor voedselverspilling, maar ook ikzelf. Een beetje mee oneens	<input checked="" type="radio"/> 2. Niet alleen de overheid en de industrie zijn verantwoordelijk voor voedselverspilling, maar ook ikzelf. Niet mee oneens/niet mee eens	<input checked="" type="radio"/> 2. Niet alleen de overheid en de industrie zijn verantwoordelijk voor voedselverspilling, maar ook ikzelf. Een beetje mee eens	<input checked="" type="radio"/> 2. Niet alleen de overheid en de industrie zijn verantwoordelijk voor voedselverspilling, maar ook ikzelf. Mee eens	<input checked="" type="radio"/> 2. Niet alleen de overheid en de industrie zijn verantwoordelijk voor voedselverspilling, maar ook ikzelf. Helemaal mee eens
3. Ik voel me medeverantwoordelijk voor het broeikaseffect. Helemaal mee oneens	<input checked="" type="radio"/> 3. Ik voel me medeverantwoordelijk voor het broeikaseffect. Helemaal mee oneens	<input checked="" type="radio"/> 3. Ik voel me medeverantwoordelijk voor het broeikaseffect. Mee oneens	<input checked="" type="radio"/> 3. Ik voel me medeverantwoordelijk voor het broeikaseffect. Een beetje mee oneens	<input checked="" type="radio"/> 3. Ik voel me medeverantwoordelijk voor het broeikaseffect. Niet mee oneens/niet mee eens	<input checked="" type="radio"/> 3. Ik voel me medeverantwoordelijk voor het broeikaseffect. Een beetje mee eens	<input checked="" type="radio"/> 3. Ik voel me medeverantwoordelijk voor het broeikaseffect. Mee eens	<input checked="" type="radio"/> 3. Ik voel me medeverantwoordelijk voor het broeikaseffect. Helemaal mee eens
4. Ik vind dat ik medeverantwoordelijk ben voor het voedselverspillingsprobleem. Helemaal mee	<input checked="" type="radio"/> 4. Ik vind dat ik medeverantwoordelijk ben voor het voedselverspillingsprobleem. Helemaal mee	<input checked="" type="radio"/> 4. Ik vind dat ik medeverantwoordelijk ben voor het voedselverspillingsprobleem. Mee oneens	<input checked="" type="radio"/> 4. Ik vind dat ik medeverantwoordelijk ben voor het voedselverspillingsprobleem. Een beetje mee oneens	<input checked="" type="radio"/> 4. Ik vind dat ik medeverantwoordelijk ben voor het voedselverspillingsprobleem. Niet mee oneens/niet mee eens	<input checked="" type="radio"/> 4. Ik vind dat ik medeverantwoordelijk ben voor het voedselverspillingsprobleem. Een beetje mee eens	<input checked="" type="radio"/> 4. Ik vind dat ik medeverantwoordelijk ben voor het voedselverspillingsprobleem. Mee eens	<input checked="" type="radio"/> 4. Ik vind dat ik medeverantwoordelijk ben voor het voedselverspillingsprobleem. Helemaal mee eens

	Helemaal mee oneens	Mee oneens	Een beetje mee oneens	Niet mee oneens/niet mee eens	Een beetje mee eens	Mee eens	Helemaal mee eens
	oneens			oneens			
5. In principe kan één persoon niet bijdragen aan het verminderen van voedselverspilling.	<input type="radio"/> 5. In principe kan één persoon niet bijdragen aan het verminderen van voedselverspilling. Helemaal mee oneens	<input type="radio"/> 5. In principe kan één persoon niet bijdragen aan het verminderen van voedselverspilling. Mee oneens	<input type="radio"/> 5. In principe kan één persoon niet bijdragen aan het verminderen van voedselverspilling. Een beetje mee oneens	<input type="radio"/> 5. In principe kan één persoon niet bijdragen aan het verminderen van voedselverspilling. Niet mee oneens/niet mee eens	<input type="radio"/> 5. In principe kan één persoon niet bijdragen aan het verminderen van voedselverspilling. Een beetje mee eens	<input type="radio"/> 5. In principe kan één persoon niet bijdragen aan het verminderen van voedselverspilling. Mee eens	<input type="radio"/> 5. In principe kan één persoon niet bijdragen aan het verminderen van voedselverspilling. Helemaal mee eens
6. Mijn bijdrage aan voedselverspilling is te verwaarlozen.	<input type="radio"/> 6. Mijn bijdrage aan voedselverspilling is te verwaarlozen. Helemaal mee oneens	<input type="radio"/> 6. Mijn bijdrage aan voedselverspilling is te verwaarlozen. Mee oneens	<input type="radio"/> 6. Mijn bijdrage aan voedselverspilling is te verwaarlozen. Een beetje mee oneens	<input type="radio"/> 6. Mijn bijdrage aan voedselverspilling is te verwaarlozen. Niet mee oneens/niet mee eens	<input type="radio"/> 6. Mijn bijdrage aan voedselverspilling is te verwaarlozen. Een beetje mee eens	<input type="radio"/> 6. Mijn bijdrage aan voedselverspilling is te verwaarlozen. Mee eens	<input type="radio"/> 6. Mijn bijdrage aan voedselverspilling is te verwaarlozen. Helemaal mee eens

In hoeverre bent u het eens met de volgende stellingen?

	Helemaal mee oneens	Mee oneens	Een beetje mee oneens	Niet mee oneens/niet mee eens	Een beetje mee eens	Mee eens	Helemaal mee eens
de samenleving.	is een probleem voor de samenleving. Helemaal mee oneens	is een probleem voor de samenleving. Mee oneens	is een probleem voor de samenleving. Een beetje mee oneens	is een probleem voor de samenleving. Niet mee oneens/niet mee eens	is een probleem voor de samenleving. Een beetje mee eens	is een probleem voor de samenleving. Mee eens	is een probleem voor de samenleving. Helemaal mee eens
5. Het is nog helemaal niet zeker dat voedselverspilling echt een probleem vormt. Helemaal mee oneens	<input type="radio"/> 5. Het is nog helemaal niet zeker dat voedselverspilling echt een probleem vormt. Helemaal mee oneens	<input type="radio"/> 5. Het is nog helemaal niet zeker dat voedselverspilling echt een probleem vormt. Mee oneens	<input type="radio"/> 5. Het is nog helemaal niet zeker dat voedselverspilling echt een probleem vormt. Een beetje mee oneens	<input type="radio"/> 5. Het is nog helemaal niet zeker dat voedselverspilling echt een probleem vormt. Niet mee oneens/niet mee eens	<input type="radio"/> 5. Het is nog helemaal niet zeker dat voedselverspilling echt een probleem vormt. Een beetje mee eens	<input type="radio"/> 5. Het is nog helemaal niet zeker dat voedselverspilling echt een probleem vormt. Mee eens	<input type="radio"/> 5. Het is nog helemaal niet zeker dat voedselverspilling echt een probleem vormt. Helemaal mee eens

In hoeverre bent u het eens met de volgende stellingen?

	Helemaal mee oneens	Mee oneens	Niet mee eens/niet mee oneens	Mee eens	Helemaal mee eens
1. De mensheid is geschapen om over de rest van de natuur te heersen.	<input type="radio"/> 1. De mensheid is geschapen om over de rest van de natuur te heersen. Helemaal mee oneens	<input type="radio"/> 1. De mensheid is geschapen om over de rest van de natuur te heersen. Mee oneens	<input type="radio"/> 1. De mensheid is geschapen om over de rest van de natuur te heersen. Niet mee eens/niet mee oneens	<input type="radio"/> 1. De mensheid is geschapen om over de rest van de natuur te heersen. Mee eens	<input type="radio"/> 1. De mensheid is geschapen om over de rest van de natuur te heersen. Helemaal mee eens
2. Mensen hebben het recht om de natuurlijke omgeving te veranderen zodat hun eigen behoeften worden vervuld.	<input type="radio"/> 2. Mensen hebben het recht om de natuurlijke omgeving te veranderen zodat hun eigen behoeften worden vervuld. Helemaal mee oneens	<input type="radio"/> 2. Mensen hebben het recht om de natuurlijke omgeving te veranderen zodat hun eigen behoeften worden vervuld. Mee oneens	<input type="radio"/> 2. Mensen hebben het recht om de natuurlijke omgeving te veranderen zodat hun eigen behoeften worden vervuld. Niet mee eens/niet mee oneens	<input type="radio"/> 2. Mensen hebben het recht om de natuurlijke omgeving te veranderen zodat hun eigen behoeften worden vervuld. Mee eens	<input type="radio"/> 2. Mensen hebben het recht om de natuurlijke omgeving te veranderen zodat hun eigen behoeften worden vervuld. Helemaal mee eens
3. Planten en dieren hebben evenveel recht om te bestaan als mensen.	<input type="radio"/> 3. Planten en dieren hebben evenveel recht om te bestaan als mensen. Helemaal mee oneens	<input type="radio"/> 3. Planten en dieren hebben evenveel recht om te bestaan als mensen. Mee oneens	<input type="radio"/> 3. Planten en dieren hebben evenveel recht om te bestaan als mensen. Niet mee eens/niet mee oneens	<input type="radio"/> 3. Planten en dieren hebben evenveel recht om te bestaan als mensen. Mee eens	<input type="radio"/> 3. Planten en dieren hebben evenveel recht om te bestaan als mensen. Helemaal mee eens
4. De vindingrijkheid van de mens zal ervoor zorgen dat we de aarde niet onleefbaar zullen maken.	<input type="radio"/> 4. De vindingrijkheid van de mens zal ervoor zorgen dat we de aarde niet	<input type="radio"/> 4. De vindingrijkheid van de mens zal ervoor zorgen dat we de aarde niet	<input type="radio"/> 4. De vindingrijkheid van de mens zal ervoor zorgen dat we de aarde niet	<input type="radio"/> 4. De vindingrijkheid van de mens zal ervoor zorgen dat we de aarde niet	<input type="radio"/> 4. De vindingrijkheid van de mens zal ervoor zorgen dat we de aarde niet

	Helemaal mee oneens	Mee oneens	Niet mee eens/niet mee oneens	Mee eens	Helemaal mee eens
	onleefbaar zullen maken. Helemaal mee oneens	onleefbaar zullen maken. Mee oneens	onleefbaar zullen maken. Niet mee eens/niet mee oneens	onleefbaar zullen maken. Mee eens	onleefbaar zullen maken. Helemaal mee eens
5. We bereiken bijna de grenzen van de hoeveelheid mensen die op aarde onderhouden kunnen worden.	<input type="radio"/> 5. We bereiken bijna de grenzen van de hoeveelheid mensen die op aarde onderhouden kunnen worden. Helemaal mee oneens	<input type="radio"/> 5. We bereiken bijna de grenzen van de hoeveelheid mensen die op aarde onderhouden kunnen worden. Mee oneens	<input type="radio"/> 5. We bereiken bijna de grenzen van de hoeveelheid mensen die op aarde onderhouden kunnen worden. Niet mee eens/niet mee oneens	<input type="radio"/> 5. We bereiken bijna de grenzen van de hoeveelheid mensen die op aarde onderhouden kunnen worden. Mee eens	<input type="radio"/> 5. We bereiken bijna de grenzen van de hoeveelheid mensen die op aarde onderhouden kunnen worden. Helemaal mee eens
6. De aarde heeft meer dan genoeg natuurlijke voorraden, we moeten alleen nog leren hoe we ze kunnen ontwikkelen.	<input type="radio"/> 6. De aarde heeft meer dan genoeg natuurlijke voorraden, we moeten alleen nog leren hoe we ze kunnen ontwikkelen. Helemaal mee oneens	<input type="radio"/> 6. De aarde heeft meer dan genoeg natuurlijke voorraden, we moeten alleen nog leren hoe we ze kunnen ontwikkelen. Mee oneens	<input type="radio"/> 6. De aarde heeft meer dan genoeg natuurlijke voorraden, we moeten alleen nog leren hoe we ze kunnen ontwikkelen. Niet mee eens/niet mee oneens	<input type="radio"/> 6. De aarde heeft meer dan genoeg natuurlijke voorraden, we moeten alleen nog leren hoe we ze kunnen ontwikkelen. Mee eens	<input type="radio"/> 6. De aarde heeft meer dan genoeg natuurlijke voorraden, we moeten alleen nog leren hoe we ze kunnen ontwikkelen. Helemaal mee eens
7. Het evenwicht van de natuur is erg gevoelig en gemakkelijk te verstoren.	<input type="radio"/> 7. Het evenwicht van de natuur is erg gevoelig en gemakkelijk te	<input type="radio"/> 7. Het evenwicht van de natuur is erg gevoelig en gemakkelijk te	<input type="radio"/> 7. Het evenwicht van de natuur is erg gevoelig en gemakkelijk te	<input type="radio"/> 7. Het evenwicht van de natuur is erg gevoelig en gemakkelijk te	<input type="radio"/> 7. Het evenwicht van de natuur is erg gevoelig en gemakkelijk te

	Helemaal mee oneens	Mee oneens	Niet mee eens/niet mee oneens	Mee eens	Helemaal mee eens
	verstoren. Helemaal mee oneens	verstoren. Mee oneens	verstoren. Niet mee eens/niet mee oneens	verstoren. Mee eens	verstoren. Helemaal mee eens
8. Als mensen ingrijpen in de natuur, heeft dat vaak rampzalige gevolgen.	<input type="radio"/> 8. Als mensen ingrijpen in de natuur, heeft dat vaak rampzalige gevolgen. Helemaal mee oneens	<input type="radio"/> 8. Als mensen ingrijpen in de natuur, heeft dat vaak rampzalige gevolgen. Mee oneens	<input type="radio"/> 8. Als mensen ingrijpen in de natuur, heeft dat vaak rampzalige gevolgen. Niet mee eens/niet mee oneens	<input type="radio"/> 8. Als mensen ingrijpen in de natuur, heeft dat vaak rampzalige gevolgen. Mee eens	<input type="radio"/> 8. Als mensen ingrijpen in de natuur, heeft dat vaak rampzalige gevolgen. Helemaal mee eens

In hoeverre bent u het eens met de volgende stellingen?

	Helemaal mee oneens	Mee oneens	Niet mee eens/niet mee oneens	Mee eens	Helemaal mee eens
9. De balans van de natuur is sterk genoeg om met de gevolgen van de moderne industrielanden om te gaan.	<input type="radio"/> 9. De balans van de natuur is sterk genoeg om met de gevolgen van de moderne industrielanden om te gaan. Helemaal mee oneens	<input type="radio"/> 9. De balans van de natuur is sterk genoeg om met de gevolgen van de moderne industrielanden om te gaan. Mee oneens	<input type="radio"/> 9. De balans van de natuur is sterk genoeg om met de gevolgen van de moderne industrielanden om te gaan. Niet mee eens/niet mee oneens	<input type="radio"/> 9. De balans van de natuur is sterk genoeg om met de gevolgen van de moderne industrielanden om te gaan. Mee eens	<input type="radio"/> 9. De balans van de natuur is sterk genoeg om met de gevolgen van de moderne industrielanden om te gaan. Helemaal mee eens
10. De aarde is net een ruimteschip met beperkte ruimte en beperkte middelen.	<input type="radio"/> 10. De aarde is net een ruimteschip met beperkte ruimte en beperkte middelen. Helemaal mee oneens	<input type="radio"/> 10. De aarde is net een ruimteschip met beperkte ruimte en beperkte middelen. Mee oneens	<input type="radio"/> 10. De aarde is net een ruimteschip met beperkte ruimte en beperkte middelen. Niet mee eens/niet mee oneens	<input type="radio"/> 10. De aarde is net een ruimteschip met beperkte ruimte en beperkte middelen. Mee eens	<input type="radio"/> 10. De aarde is net een ruimteschip met beperkte ruimte en beperkte middelen. Helemaal mee eens
11. Ondanks onze bijzondere vaardigheden als mens, zijn we nog steeds onderworpen aan de wetten van de natuur.	<input type="radio"/> 11. Ondanks onze bijzondere vaardigheden als mens, zijn we nog steeds onderworpen aan de wetten van de natuur. Helemaal mee oneens	<input type="radio"/> 11. Ondanks onze bijzondere vaardigheden als mens, zijn we nog steeds onderworpen aan de wetten van de natuur. Mee oneens	<input type="radio"/> 11. Ondanks onze bijzondere vaardigheden als mens, zijn we nog steeds onderworpen aan de wetten van de natuur. Niet mee eens/niet mee oneens	<input type="radio"/> 11. Ondanks onze bijzondere vaardigheden als mens, zijn we nog steeds onderworpen aan de wetten van de natuur. Mee eens	<input type="radio"/> 11. Ondanks onze bijzondere vaardigheden als mens, zijn we nog steeds onderworpen aan de wetten van de natuur. Helemaal mee eens
12. De mens is het milieu ernstig aan het misbruiken.	<input type="radio"/> 12. De mens is het milieu ernstig aan het	<input type="radio"/> 12. De mens is het milieu ernstig aan het	<input type="radio"/> 12. De mens is het milieu ernstig aan het	<input type="radio"/> 12. De mens is het milieu ernstig aan het	<input type="radio"/> 12. De mens is het milieu ernstig aan het

	Helemaal mee oneens	Mee oneens	Niet mee eens/niet mee oneens	Mee eens	Helemaal mee eens
	misbruiken. Helemaal mee oneens	misbruiken. Mee oneens	misbruiken. Niet mee eens/niet mee oneens	misbruiken. Mee eens	misbruiken. Helemaal mee eens
13. De zogenaamde ‘ecologische crisis’ die de mensheid boven het hoofd hangt, is sterk overdreven.	<input type="radio"/> 13. De zogenaamde ‘ecologische crisis’ die de mensheid boven het hoofd hangt, is sterk overdreven. Helemaal mee oneens	<input type="radio"/> 13. De zogenaamde ‘ecologische crisis’ die de mensheid boven het hoofd hangt, is sterk overdreven. Mee oneens	<input type="radio"/> 13. De zogenaamde ‘ecologische crisis’ die de mensheid boven het hoofd hangt, is sterk overdreven. Niet mee eens/niet mee oneens	<input type="radio"/> 13. De zogenaamde ‘ecologische crisis’ die de mensheid boven het hoofd hangt, is sterk overdreven. Mee eens	<input type="radio"/> 13. De zogenaamde ‘ecologische crisis’ die de mensheid boven het hoofd hangt, is sterk overdreven. Helemaal mee eens
14. Mensen zullen uiteindelijk genoeg leren over de werking van de natuur, dat zij in staat zullen zijn haar te beheersen.	<input type="radio"/> 14. Mensen zullen uiteindelijk genoeg leren over de werking van de natuur, dat zij in staat zullen zijn haar te beheersen. Helemaal mee oneens	<input type="radio"/> 14. Mensen zullen uiteindelijk genoeg leren over de werking van de natuur, dat zij in staat zullen zijn haar te beheersen. Mee oneens	<input type="radio"/> 14. Mensen zullen uiteindelijk genoeg leren over de werking van de natuur, dat zij in staat zullen zijn haar te beheersen. Niet mee eens/niet mee oneens	<input type="radio"/> 14. Mensen zullen uiteindelijk genoeg leren over de werking van de natuur, dat zij in staat zullen zijn haar te beheersen. Mee eens	<input type="radio"/> 14. Mensen zullen uiteindelijk genoeg leren over de werking van de natuur, dat zij in staat zullen zijn haar te beheersen. Helemaal mee eens
15. Als alles doorgaat op de manier waarop het nu gaat, zullen we snel een enorme ecologische catastrofe gaan.	<input type="radio"/> 15. Als alles doorgaat op de manier waarop het nu gaat, zullen we snel een enorme ecologische catastrofe	<input type="radio"/> 15. Als alles doorgaat op de manier waarop het nu gaat, zullen we snel een enorme ecologische catastrofe	<input type="radio"/> 15. Als alles doorgaat op de manier waarop het nu gaat, zullen we snel een enorme ecologische catastrofe	<input type="radio"/> 15. Als alles doorgaat op de manier waarop het nu gaat, zullen we snel een enorme ecologische catastrofe	<input type="radio"/> 15. Als alles doorgaat op de manier waarop het nu gaat, zullen we snel een enorme ecologische catastrofe

	Helemaal mee oneens	Mee oneens	Niet mee eens/niet mee oneens	Mee eens	Helemaal mee eens
	tegemoet gaan. Helemaal mee oneens	tegemoet gaan. Mee oneens	tegemoet gaan. Niet mee eens/niet mee oneens	tegemoet gaan. Mee eens	tegemoet gaan. Helemaal mee eens

Wat is uw geslacht?

- Man
- Vrouw

Hoe oud bent u?

Aantal jaar:

Wat is uw hoogst voltooide opleidingsniveau?

- Geen of alleen basisonderwijs
- VMBO/MAVO
- HAVO
- VWO/Atheneum/Gymnasium/Technasium
- MBO
- HBO
- WO

Wat is uw huidige status?

- Werkend
- Studerend
- Werkloos

Uit hoeveel personen bestaat uw huishouden, inclusief uzelf?

- 1 persoon
- 2 personen
- 3 personen
- 4 personen
- 5 personen
- 6 personen
- Meer dan 6 personen

Wat is de samenstelling van uw huishouden?

- Eenouderhuishouden met kind(eren)
- Huishouden met ouderpaar met kind(eren)
- Huishouden met ouderpaar zonder kind(eren)
- Meerpersoonshuishouden met kind(eren)
- Meerpersoonshuishouden zonder kind(eren)
- Overig huishouden