Consumption life cycle contributions

Assessment of practical methodologies for in-home food waste measurement

Authors

Erica van Herpen, Wageningen University - Marketing and Consumer Behaviour Group

Ivo van der Lans, Wageningen University - Marketing and Consumer Behaviour Group

Mariska Nijenhuis-de Vries, Wageningen Food and Biobased Research

Nancy Holthuysen, Wageningen Food and Biobased Research

Stefanie Kremer, Wageningen Food and Biobased Research

Daniella Stijnen, Wageningen Food and Biobased Research

With contributions by:

Tom Quested, WRAP

Lisanne van Geffen, Wageningen University - Marketing and Consumer Behaviour Group

With thanks to:

Hilke Bos-Brouwers, Wageningen Food and Biobased Research

Hans van Trijp, Wageningen University - Marketing and Consumer Behaviour Group

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Acknowledgments & Disclaimer

This report forms the basis for Milestone 2 (M2) of REFRESH Work Package 1. The Milestone report will contain the final survey type measure for quantifying food waste in the household with all survey material translated to English.

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1   Executive Summary

This report is part of the EU funded H2020 project REFRESH (Resource Efficient Food and dRink for the Entire Supply cHain). The objective of the reported study is to scientifically develop and validate a practical measurement approach for the amount of in-home food waste at the household level.

As a first step, a literature search of both academic and grey literature was undertaken. This resulted in the identification of five different measurement methods: food waste diary, self-reports (survey), in-home observation, waste compositional analysis, and self-collection through kitchen caddies. Related advantages and disadvantages as discussed in the various papers and reports were summarized.

Next, 13 expert interviews were conducted, to gain more insight into the experiences with these measurement methods, their main advantages and disadvantages, and their practical applicability in various settings. Insights from literature and experts were then compared.

Our research findings suggest that the diary method was seen as relatively effortful for both the participant and the researcher. Moreover, keeping the diary increases participant awareness, thereby potentially influencing the food waste behaviour itself. Self-reports (survey) based measurements, in contrast, are relatively easy to collect, but the experts expressed concern about a lack of validity. The method of in-home observation led to concerns about privacy and also has limitations in terms of the amount of time, money, and effort needed. This method was deemed less suitable for the purpose of data collection in the current study, and was replaced by a method in which participants photograph their food waste and rate their discarded amounts (photo coding measurement). Waste compositional analysis was met with different opinions. It is both advocated for having a low bias and critiqued for underestimating waste due to neglecting of liquids and waste disposed of via composting at home. Because waste compositional analysis does not offer a possibility to differentiate phases when food is wasted (which is relevant for the overall project), this method is not further included. Kitchen caddies are a suitable alternative method, for which the experts had less experience but generally positive attitudes.

In a pilot experiment, conducted in the Netherlands with 30 participants, the methods of survey, diary, photos and caddies were selected for further examination, in order to test the operationalization of the measurements. Based on the results, details in the operationalization (e.g. wording of the questionnaire, guiding explanations for participants, photo and estimation procedure) were be adjusted. Our operationalisation of different distinguished stages of the wasted food (e.g. partly used food, remainders from a meal) appeared suitable. Results also showed considerable variance in food waste, both across days (up to 580 grams on a single waste occasion) and across people (0 to 2162 grams during the two week period).

Although the photo coding measurement method seemed promising, it was necessary to tackle uncertainties expressed by several experts and coders from

the pilot study, with regards to the reliability of the rating by the participants in the pilot experiment. Therefore, a separate study to test whether photo coding of food waste can be used as accurate measurement methodology to assess food waste at household level was conducted.

To this end, a standard set of photos was produced, of which the exact amounts and composition were established beforehand. This food waste differed in product category, volume, density, and container size. Next, the weight of 104 photographed food waste instances was estimated by two independent coders who had full access to online resources to help their coding of the amount of food waste. Results showed a high correlation between the actual weight of the food waste and the average coded weight (r = .93), as well as a systematic underestimation of the food weight for one of the coders (but not for the other coder). This indicates that photo coding has promising potential for measuring food waste at household level, although training of the coder(s) may be needed to reduce potential underreporting.

In the main study, we subsequently compared the five selected measurement methods of general survey of food waste amounts, self-report survey targeting a specific period of time, food waste diary, caddy and photo coding. The study included a three-group design. All participants used the survey method to assess their general waste management prior to week one, and on their waste assessment measures following week 1, prior to week 2. Group I kept diaries of their food waste during both week 1 and week 2. Group II only provided complementary diary measures for food waste in week 2. Group III served as a "benchmark", providing both in week 1 and week 2 a combined set of measurement methods including self-report survey, diary, caddy, and photo coding. The measurement methods were compared based on reported amounts, frequency and proportion as well as the correlations between the different methods.

Overall, the general survey of food waste amounts proved less appropriate for measuring food waste as it showed, contrary to other methods, low levels of reported food waste and low variance in reported food waste across households. People appear to generally think that they waste a relatively low amount of food, compared to others.

Furthermore, there appears to be a high correlation between the two weeks of measurement across the various measurement methods. This suggests that the application of one method of measurement for a single week can provide valuable information on household food waste in generalising terms. However, longer term or a repetitive measurement studies should confirm this observation.

In the underlying study, comparison of the measurement methods is primarily based on their degree of correlation in measuring food waste. Additionally, the absolute amount of waste measured with each of the methods is compared, which is relevant for studies in which a description of the amount of food waste is important. Studies with the objective of describing the amount of food waste may consider incorporating a correction factor for methods that seem to underreport food waste. For studies that aim to investigate or predict differences in food

waste between households, the correlational information should be more relevant.

For large-scale measurements, a pre-announced survey about food waste in the past week appears as a viable alternative to diary measurement. For small samples, kitchen caddies and photo coding are also good alternatives. General self-reports on amount, frequency, or proportion of food waste (not related to the past week) are not advisable to gain a good estimate of household food waste.

2 Introduction

This report is part of the EU funded H2020 project REFRESH (Resource Efficient Food and dRink for the Entire Supply cHain), under project no. 641933. REFRESH addresses both waste prevention and creates new options to prevent material becoming waste. The project aims to contribute significantly towards the objective of reducing food waste across the EU and maximise the value from unavoidable food waste and packaging materials. A central ambition of the REFRESH project is to develop and demonstrate a 'Framework for Action' (FA) model that is based on: strategic agreements across all stages of the supply chain; underpinned by robust policy; delivered through collaborative working; supported by science and evidence-based tools, which will allow targeted cost effective interventions and support transformation towards a more sustainable and secure EU food system.

The EC FP7 funded Project FUSIONS reported earlier in 2016 in their report on "*Estimates of European food waste levels*" (Stenmarck et al.), that approx. 47 million tonnes of food waste are derived at household level annually. This represents 53% of food waste generated across the whole food supply chain. Understandably, gaining insight in consumer behaviour related to food waste prevention and reduction has become a major issue. Therefore, an important part of the REFRESH Project focuses on consumer understanding in relation to waste generation, handling, reuse, and by-product valorisation.

2.1 Objective

The current report focuses on developing practical methodologies for food waste assessment, in order to create a practical measurement approach for food waste and underlying motivations across the stages of the consumption life cycle. These insights can be used to support the development and measure the effectiveness of interventions targeting consumer behavioural change which will be implemented later in the REFRESH Project.

The objective of this work is to scientifically develop and validate a practical measurement approach for food waste at household level. Promising existing and new available methods to measure food waste will be examined, and content validity will be tested using the procedures available from the field of scale development. The emphasis will be on testing for convergent validity between the various measurement approaches. The use of a combination of methods is a possibility that will be examined as well.

To be able to understand the mechanisms behind consumer food waste, measurements of food waste at home should ideally provide information about the level of food waste across the different stages of the consumption life cycle, next to information on the type of products disposed of. These stages were formulated in detail in the REFRESH report "*Causes and determinants of consumers food waste: a theoretical framework*" (Van Geffen et al., 2016) and can be summarised as follows: planning – provisioning – storing – preparing – consuming – disposal.

As food waste can occur as a result of multiple behaviours across any of these stages, it is necessary to focus on the different types of food waste that are generated (e.g. differentiate between unprepared food, prepared food, leftover food etc.). These differences are an indication of the stages that the food has gone through in the consumption life cycle before it was wasted, but the link is imperfect, as the drivers behind the disposal may not necessarily be related to the last stage and could have occurred earlier on.

Measurements need to be on a scale that can be compared across stages and across households. The insights on measurement methodologies and issues around practical operationalisation in a research setting will potentially be able to inform a wide range of future research. In the context of REFRESH, this study is designed to develop a scientifically informed measurement method for household food waste that can be used within an appropriate format to collect quantitative data on consumer understanding across the EU regions in a later stage of the Project. The scope of the measurement method is aimed at food waste at the household level (in-home). Interested readers who want more information about the measurement of out-of-home waste such as food services or catering are referred for example to the study of Hanks et al. (2014), which provides a comparison of different waste measurement methods in a canteen setting.

2.2 Definition of food waste

For the definition of food waste, the definitional framework developed within the EU FP7 project FUSIONS (Food Use for Social Innovation by Optimising Waste Prevention Strategies) is taken as starting point. In its publication of July 2014 (Östergren et al.), food waste is defined as follows:

> *"Food waste is any food, and inedible parts of food, removed from the food supply chain to be recovered or disposed (including composed, crops ploughed in / not harvested, anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)."*

A main assumption within the definitional framework of FUSIONS is that food waste is related to the destination of removed food from the Food Supply Chain, and specifies the destinations that are considered waste from a resource efficiency perspective. The non-waste destinations of food that is not eaten by humans are animal feed and biobased materials and biochemicals. These destination categories are considered as re-use and valorisation, and thus not as food waste.

FUSIONS goes on to explain that food waste refers to food appropriate for and intended for human consumption being discarded, whether or not after it is kept beyond its expiry date or left to spoil.

The FUSIONS Definitional Framework was developed from a supply-chain and resource efficiency perspective. The current research of REFRESH on Consumer behaviour and engagement (WP1) focuses on the food wasted by consumers, in households and out-of-home. As consumers themselves are often not in control of the destination of the discarded food that leaves their home (or their out-of-home

site), food waste is scoped here to involve the stages from acquisition through discarding within the household or out-of-home boundary. Discarding can take many forms, e.g. putting in the (residual waste or organic waste) bin, feeding it to household pets, home-composting etc. Regardless of the manner of disposal, the starting point for this study is food intended and appropriate for human consumption, but not consumed by humans.

The FUSIONS definitional framework includes both edible and inedible fractions of food into food waste categories. The major reason to do this is from a waste quantification and resource efficiency in the food supply chain perspective to which all waste categories add on. However, the FUSIONS project also recommends to measure edible and inedible part separately in order to better identify interventions. For the purpose of this research, the focus is on the edible food fractions within consumer food discards, and will be referred to as 'food waste' in the remainder of the study. Other scientific studies within the consumer behaviour body of literature also follow this scope (e.g. Katajajuuri et al., 2014; Stefan et al., 2013; Stancu et al., 2016).

2.3 Structure of the rest of the report

The rest of the report is structured as follows. Section 3 describes a **literature review** of papers and reports that describe methods used to measure consumer food waste. The various measurement approaches are summarized into five main methods of measuring consumer food waste (diaries, self-reporting, observation, waste compositional analysis, and self-collection). Distinct advantages and disadvantages of these methods that become apparent in the literature review are subsequently discussed in Section 4.

Next, four empirical data collections have been conducted.

First, in **Study 1, expert practitioners** are invited to provide their insights on the advantages and disadvantages of the measurement methods. The setup and outcomes of this practitioner input is described in Section 5. Insights gained are combined with the insights from the literature review to arrive at a final comparison of the research methods.

Next, in **Study 2**, the methods that could be feasible are operationalized and examined in a **pilot experimental study to operationalize measurements** (Section 6). The main objective of this pilot study is to obtain insights in the practicalities of the measurement methods: are questions understood by participants? How often need waste be collected in the case of kitchen caddies? How effortful do participants feel that the methods are? Based on the outcomes of the pilot study, the measures are adjusted and critically re-evaluated.

In a separate study, **Study 3, photographic measurements** were further investigated (Section 7). In this study, photographs depicted food waste that structurally varied in product category, food density, amount of food, and container size. The food on the photographs was carefully weighed, and compared to the amount estimated by independent coders.

Finally, **Study 4** is the **main experiment** in which the most promising measures of food waste are compared. Section 8 describes this main study and its outcomes.

The final section provides **conclusions and discussion**.

3   Literature review

As a first step, an overview was conducted of relevant papers and reports, to assess the state-of-the-art food waste measurements that are being employed. Both papers in the academic literature and reports outside of academia (so-called grey literature) have been included.

3.1 Inclusion criteria

Selected studies need to be relevant for the selection of appropriate measurement methods, keeping in mind the objectives of the task.

The following inclusion criteria have been used for the overview of both academic and grey literature:

> The target of the food waste measurement are consumers / households.
>
> Measurement at the household level. Studies applying measurements at the city / neighbourhood level are excluded.
>
> Study uses primary data collection, that is, uses empirical measurement or approximation of food waste. Studies containing only desk research are not included. Studies which explicitly compare measurement methods (but without primary research) are discussed in 3.4.
>
> Studies assess food waste, not overall waste. This excludes waste compositional analyses where overall household waste is the topic of investigation.
>
> The focus is on at-home measurements. At-home measurements refer to food waste that occurs in the home itself (including at-home delivery), whereas out-of-home refers to eating occasions that occur elsewhere (e.g. restaurant, canteens, catering, kiosk). The latter is not included in this report.
>
> The amount of food waste is assessed with the intention to measure this, not as an intervention strategy. Several campaigns ask participants to keep track of their food waste as a strategy for increasing awareness of the issue and motivation to change. Because the current investigation aims for an accurate measurement method, intervention strategies which primarily aim to change the underlying behaviour are not suitable. Studies with measurements of food waste that inadvertently also increase awareness, but which aim primarily at correct measurement, are included.

The overview contains information on the source, the measurement method used, sample characteristics, and specific questions and measurements. Where possible, appendices provide more specifics about the various measures that have been used.

3.2 Study selection

To find relevant academic literature, a search for relevant papers was conducted in Web of Science™ and Google Scholar, using "food waste" and "consumer" as keywords. The reference list of identified papers was further examined to find other relevant papers.

Relevant research reports were collected by searching references from the FUSIONS Project reports (www.eu-fusions.org/publications) and further examining the reference list to find other relevant research reports. Finally, practitioners involved in food waste projects provided research reports.

3.3 Summary of measurement methods

Annex 1 provides an overview of the papers that have been identified in literature. In many papers and reports, multiple research methods were employed (e.g., food waste diaries followed by a focus group). This is indicated in the table. In assigning a paper or report to a measurement method category, the way in which food waste was measured was vital. Thus, if a study used a food waste diary to assess the amount of waste generated in the household, the study was taken up in the "diary" category, irrespective of whether the participants were also included in a focus group later on or were interviewed individually, for example. If a study includes multiple methods of measuring food waste (e.g., both a diary and waste compositional analysis), it is taken up in multiple categories in the table.

In categorizing the studies, we found that the following relevant measurement methods for the amount of food waste in consumer households have been used and reported upon in prior literature:

1   Food waste diary

Diaries are commonly used to report food waste. Participants are asked to report the amount of food that they waste over a period of several days. The diaries typically include the type, amount, and reason for disposal of food products. In addition to a written record, some studies provided participants with weighing scales to measures the weight of discarded food with (e.g., Katajajuuni et al., 2014). Other diary-based studies have asked participants to describe the amount of waste (e.g. 2 slices of toast, 3 apples, a handful of grated cheese). The diary studies that we encountered typically used pen-and-paper formats, or sometimes digital formats that could be filled in on a computer or smart phone / tablet. Using a web-based application provides a more high-tech approach to diary keeping, potentially with its own advantages and disadvantages.

2   Self-reports in questionnaires and interviews (survey)

Self-reports of food waste behaviour have also been utilized in surveys and in-depth interviews. Participants are asked at one point in time to answer questions on their level of food waste. This could be done on paper, online, or in an in-depth interview. Several self-report measurements were encountered:

1. Proportional waste measurement

Proportional or relative measures of food waste have recently appeared in academic literature (e.g., Stefan et al., 2013; Stancu et al., 2016). These measures ask participants to report the percentage or proportion of food items brought into the household that goes to waste.

Non-proportional scale (absolute / frequency)

Absolute waste measures require people to directly report on the amount of food waste in their home, without the use of diaries or other instruments. As people generally will not know the

exact amount, this has been asked using frequency measures (how often food is wasted: regularly to never; Parizeau et al., 2015) or by using very broad categories (e.g., definitely wasting to no wasting; Gül et al., 2003).

Photographs of actual waste

In qualitative studies, consumers have sometimes been asked to photograph the food they dispose of (e.g., Farr-Wharton et al, 2012). This has not been encountered as a stand-alone measure of food waste.

Images / photographs as an aide to estimate amounts

Another use for photographs or images, is to provide images to participants as an aid in reporting the level of food waste. Martindale (2014) has used oval shaped pictures for this, and the use of pictures / photographs of different amounts of food waste has been suggested as well.

3   In-home observations

In one MSc thesis (Glanz, 2008) observation was made of expired products in the household, through a search for potentially wasted food (not yet disposed of) in storage together and with the approval of participants as part of an in-depth interview.

New technologies can be applied to the observation of food waste (observation-based measures), which hold potential in improving the accuracy of measurements while lowering the burden for participants. These include the use of video-recording, trashcan cameras and/or automatic electronic weighing of waste in the trashcan. Use of such new technologies has not been reported yet, as far as we encountered.

4   Waste compositional analysis

In this method, food waste of individual households is collected, and physically separated, weighed and categorized. It has also been referred to as "waste characterization" or "waste sort". This method can be applied to kerb-side collection (to find food waste in the 'solid' waste streams including residual (general), separate food and mixed food and garden).

5   Self-collection of in-home waste: Kitchen caddies

Studies have asked people to collect and turn in their food waste. This is usually done by having people fill caddies, bins, or other containers with their food waste. This can occur daily or weekly. Rather than having people hand over the actual waste, it may be possible to (partly) have them hand over digital records. Several household panels have equipped their participants with home-scanners to report purchased items. These scanners have the potential to be used to report waste as well.

3.4 Prior studies and reports comparing measurements

In the literature search, we also identified several papers / reports in which various food waste measurements were compared. The out-of-home measurement comparison of Hanks et al. (2014) will not be discussed in this report, but should be relevant for readers interested in out-of-home food waste

measurement. The focus of this report is on the in-home measurement methodologies comparisons.

The FUSIONS project (2012-2016, www.eu-fusions.org) has examined and compared food waste reporting methods in the report entitled "*Report on review of (food) waste reporting methodology and practice*" (FUSIONS: Møller et al., 2014). This report examines measures across the supply chain, whereas we focus specifically at the consumer and household level. The FUSIONS report compares relevant methods such as diaries and surveys, and also mentions that a combination of different methods is often used. Specific advantages and disadvantages mentioned in the report are taken up in Section 4.

Sharp et al. (2010) present a desk study of various measurements, including self-weighing / reporting and behaviour surveys, among others. They report advantages and disadvantages of these measurements, which will be taken up in Section 4. Additionally, they indicate that using a combination of measurements ('suite of well-planned monitoring methods') is often recommended.

The Master thesis of Høj (2011) compared the diary method to a compositional analysis, using secondary data analysis. Results indicate that the diary method underestimates the amount of waste produced, especially for households with children and households of multiple adults.

4 Evaluation of measurement methods based on literature

Based on the literature, advantages and disadvantages of the various measures of food waste can be summarized. In describing these, we focus on the following criteria for measurement evaluation:

1. Degree to which estimates of food waste can be biased. Biased estimates can occur due to various reasons: underreporting, problems in estimating a given amount or percentage, problems in articulating a given amount, or influences of the measurement method itself on the amount of food that is wasted.

2. Effort required of participants. When effort for participants is high, this can have adverse consequences such as a high drop-out rate, risk for self-selection (e.g. only participants who are interested in the topic choose to participate) and inaccuracies in the data due to fatigue.

3. Effort and costs for the researcher. This focuses primarily on the effort required for data handling and analysis, as well as costs for material development (e.g. photograph material) and provision of equipment (e.g., weighing scales), if applicable. The ability of a method to handle large samples of participants will be a direct function of the effort and costs for the researcher. Effort required for participant selection should be correlated to the second criterion and is not repeated here.

4. Ability of the measurement method to provide information at a detailed level (e.g. provide information on prepared vs. unprepared food waste, or across consumption cycle stages) in addition to a more general level (i.e. overall food waste estimate), and on a scale that allows comparison.

With these criteria in mind, the next sections will describe advantages and disadvantages of the methods that were identified during the literature search (see section 3.3). Self-reports by using a diary will be discussed separately from self-reports in questionnaires and interviews.

4.1 Food waste diary

Langley et al. (2009) describe the task of keeping a food waste diary as considerable, and report a tapering of enthusiasm of participants over the period in which the diary was kept (one week). Sharp et al. (2010) also mention the required close interaction with the household representative as a potential disadvantage. The effort required of participants furthermore implies not only difficulties in recruitment and high dropout rates, but also the potential risk of self-selection and poor data quality (Sharp et al., 2010; FUSIONS: Møller et al., 2014). Also important is the finding that the diary method itself can lead to changes in waste habits (Langley et al., 2009), as it can be a motivator for behaviour change and a visible reminder (Sharp et al., 2010).

Whether the amount of food waste is reported as (absolute) weight (in grams) or approximation (in items, size, or other measurement unit) has important implications for the diary method. Whereas measurement in weight puts a relatively high reporting burden on the participant, who needs to weigh their food waste, measurement in a mixture of units puts a relatively high burden on the researcher, who needs to subsequently transform these to a standardized unit of measurement before any comparisons can be made.

Using a web-based application to support diary keeping on a mobile phone (for instance) may be appealing to some participants, but probably not all. Not all persons have access to the internet or to mobile apps.

4.2 Self-reports in questionnaires and interviews (survey)

In self-reports it is not always straightforward to ensure that questions are clear and unambiguous, especially for a topic such as food waste (FUSIONS: Møller, 2014). Another major disadvantage of self-reports are that these draw upon people's memory, which can be faulty. The method relies on participant's ability to accurately approximate the amount of food waste from memory and to mentally 'add it all up', and this can easily introduce biases in these estimates. This is especially the case because food-wasting behaviours are not top-of-mind for most people and often the resultant of a multiple routinized behaviours, which makes biases very likely (http://flwprotocol.org/). Another disadvantage is the potential for giving socially desirable answers. Advantages of self-report measures are that these can be collected at relatively low costs for the researcher and extended to larger samples, and typically require less effort of participants than several of the other measurement approaches.

In addition to these general advantages and disadvantages of self-report measurements, there are specific points of consideration. Both proportional and absolute self-report measurements depend on consumer memory and this may lead to biased estimates. Proportional measures attempt to overcome this by linking the level of waste to the food brought into the home (of which consumers may be more aware), whereas absolute measurements often resort to very broad answer categories (e.g. Gül et al., 2003) or to report the frequency of waste discards rather than how much was wasted (Parizeau et al., 2015). This limits the level of detail present in the data.

Some self-report measurements have asked people to photograph their own food waste. Because the coding of these photographs can be very time-consuming, this method can lead to high costs of data handling and applicability to large samples may be difficult.

The use of photographs provided by the researcher, as an aide for consumers to more correctly report the amount of food waste, has the potential of limiting biases due to problems in estimating and in articulating the amount of food waste.

4.3 In-home observations

The use of video-recording, trashcan camera, and/or automatic electronic weighing of waste in trashcan has the potential for rich information on behaviour and actual food waste, with lower effort for participants and researchers. Potential issues are the cost involved, the reliance on new, not yet fully tested, technology, and the required work in keeping track of and interpreting the data. Also, a potential pitfall of observation of, for example, expired products in the household, are that products that are not yet expired could still be wasted and that products that have expired according to the date label may still be consumed.

4.4 Waste compositional analysis

Waste compositional analysis can be done using various approaches. Dahlén and Lagerkvist (2008) provide an overview of twenty known methods, and indicate various sources of error. In addition, Lebersorger and Schneider (2011) provide an in-depth discussion of the methodology for determining food waste in waste composition studies. We refer to these overviews for more details on the specific advantages and disadvantages of different types of waste compositional analysis.

Overall, compared to other methods, waste compositional analysis requires specific knowledge, is costly and time-consuming for the researcher, and cannot be used to distinguish different food waste occurring in different consumption life-cycle stages. In addition, waste compositional analysis typically focuses on the waste put out for collection, which implies that the researcher is unable to observe food waste that was disposed of by other means (e.g. sink waste disposal units, home composting, animal feed) (Parizeau et al., 2015).

4.5 Self-collection of in-home waste: Kitchen caddies

Collection of in-home waste provides an overall measurement of the amount of kilograms of waste, but unless this method is combined with other measures, details on the why and which stage of the consumption cycle the food waste originates are lacking. This method can require some effort of participants in adhering to the procedure, depending on where and in what way the waste collection takes place. Effort for researchers can be substantial, as on-site visits to people's homes may be required.

Self-collection could potentially be aided by scanning the barcodes of products that are thrown away. By itself, scanning is probably not a suitable "stand-alone" method. Scanning can only be applied when a product is packed, since the bar code is used for this purpose, and in the FUSIONS report (Møller et al., 2014) this method is therefore not recommended for the consumer level. People may waste part of a food product without the packaging (e.g. when used in a dish that is later reduced to waste) or a packaging may be discarded well before the food it contained is wasted. As only part of the food wasted in a household will thus be in its original container when discarded, scanning cannot be used to record all food waste. It might prove useful in combination with another measurement method. Additionally, using this measurement would require participants to have scanning equipment.

5 Study 1: Expert practitioners' view

5.1 Objective of Study 1

The objective of this study is to investigate practitioners' view on food waste measurement methods. Given the fact that many different methods have been identified in the literature, and food waste measurement is a relatively novel research topic, hands-on experience from practitioners can provide valuable information. This section explains the procedure to collect their input and summarises the result of study 1.

5.2 Identifying potential experts

A list of potential informants was created, based on a call within the REFRESH consortium to use their network contacts to provide names of experts eligible for the study. The reference list of the literature used in the review (detailed in section 4) also provided potential experts. A total of 27 potential experts were contacted, of which 13 participated (response rate of 48 %).

5.3 Procedure

Experts were contacted by email in December 2015 and were invited to participate in the practitioner input study (see Annex 2 for the invitation email). In exchange for their participation, they were offered a summary of the evaluations of all other contacted experts in February 2016.

The following steps were taken:

STEP 1: Experts were requested to reply directly to the invitation and to indicate whether or not they were willing to participate. Invitation e-mail in Annex 2.

STEP 2: Once they had indicated their willingness to participate, they received the survey by email (see Annex 3) and an appointment for an interview (by telephone) was made for January 2016.

In the survey, informants were asked to evaluate the measurement methods based on the criteria mentioned in Section 4. In addition, the experts were asked to give their input on the following general questions:

- Do you have any general points that you would like to highlight? For instance, issues that are applicable to a large number of methods?

- Did you miss any methods in the list above? If so, what did you miss?

- Which measurement method would you prefer to use if you were to set up a large-scale quantitative study on food waste? (e.g. around 1000 participants)

- Would you prefer a different measurement method for a smaller-scaled study? (e.g. around 30 participants)

- Are you aware of any references that would be useful in the context of evaluating methods (e.g. studies comparing methods of food waste measurement in households)?

STEP 3: In preparation for this interview, experts were asked to read the questions, and type in their responses to the open-ended questions in the word document. Experts were asked to return this document prior to the interview, in order for the researcher to prepare for the interview.

STEP 4: The interviews took place in the second and third week of January 2016.

STEP 5: Summary of the interviews was constructed.

STEP 6: Return of the summary to the informants for a final check. The accompanying e-mail is included in Annex 4.

STEP 7: Incorporation of additional information (if provided) into the summary.

Based on these steps, an overview on main advantages and disadvantages of measurement methods according to the practitioners' input was created, see below.

5.4 Main advantages and disadvantages of measurement methods according to practitioners

The advantages and disadvantages of each of the measurement methods, as described by the experts are indicated in Annex 5. These can be summarized as follows:

The diary method: In general the diary method can be used to quantify food waste in a relatively easy way. However this method also has its limitations, including awareness increases while measuring food waste (influencing the discard behaviour), and the occurrence of underestimation or underreporting. It needs more effort from the participants compared to other methods especially when detailed information is asked.

The survey: In general the survey method can be used to give insight into WHY respondents waste food (motives). However, informants feel that this is not an accurate method to quantify food waste. They seem particularly worried about the validity of the measurement (whether the amount indicated is an accurate number).

In-home observation: In general the in-home observation method can be used to give insight in the real behaviour of consumers. Because the researchers are present they are able to ask in-depth questions. Although some experts think this method can be used to quantify food waste accurately, others think this method is better for understanding drivers and behaviour itself, but not ideal for quantification purposes. They all agree that this is a time-consuming and expensive method (not suitable for large groups). Also the privacy of the participants can be an issue.

Waste compositional analysis: In general, waste compositional analyses can be used to quantify the food waste of consumers in an accurate way. However,

the experts that were interviewed felt that it gives less information at a detailed level, because it can be hard to separate the waste. This response of experts does not line up with some waste compositional analyses that have been performed where food has been separated into over 100 categories. Furthermore, the experts felt it is a time consuming and expensive method, risky to health and unpleasant for the researchers.

Kitchen caddies: In general the kitchen caddies method can be used to quantify the food waste of consumers in an accurate way. It can also give information at a detailed level if multiple bins are used and participants follow the instructions precisely. However this method needs a lot of effort from the researchers especially in the logistics. There was very little experience of this method by those interviewed so most of the remarks are based on thoughts about the method, rather than direct experience of the method.

When asked about the preferred method for large samples (n = 1000), the most common suggestions were the diary in combination with a survey and waste compositional analysis in combination with a survey. For small samples (n = 30), in-home observations, diary, and kitchen caddies were mentioned. No new methods were brought forward by the experts that were interviewed.

5.5 Conclusion based on literature research and practitioners' input

This section summarizes the main advantages and disadvantages for each of the methods that appeared in the literature review and the expert interviews. It integrates the information from both sides, to identify the most relevant advantages and disadvantages, and compare these against the criteria set for the measurement approach. Based on this, decisions are made regarding the inclusion or exclusion of these methods in the empirical study that will follow.

5.5.1 Food waste diary

Both prior research and the informants point out that this method has limitations because it increases awareness (thereby affecting the behaviour of interest) and requires considerable effort from participants. Informants furthermore indicate that considerable effort is also required from the researchers and that samples may be biased towards people who are already interested in the issue. They mention that ICT can be very useful in sending reminders and keeping motivation of participants high.

When asked about methods that can be used in large samples, the diary method is mentioned by the experts in combination with other methods. Therefore, in the subsequent studies in this task, we will include a diary. The diary will be kept to the minimum needed to assess the amount of food waste across the stages of the product life cycle, so as to keep the burden for participants as low as possible.

5.5.2 Self-reports in questionnaires and interviews (survey)

Experts clearly agree that the survey method is easy for participants and researchers alike, but not good for obtaining accurate quantified data. To date,

however, there is little insight in how accurate or inaccurate the data is exactly as it has hardly been compared with other methods. In particular, it would be relevant to obtain insights into the extent to which underreporting is equal across all stages of the product life cycle (and thus percentages of waste for each stage would be unaffected) and across people (so that persons who waste more are still identified as such) or not.

In the subsequent studies in this task, we will include self-report measures, to examine this further. Measures related to the relative proportion of food that is wasted and to the frequency with which food is wasted were deemed most promising by the experts, and we will thus focus on these.

5.5.3   In-home observations

In-home observation has disadvantages in terms of time, money, and effort involved, and these have become apparent both through the literature review and the expert interviews. There are also privacy concerns. Still, the method can be very useful for gaining insight into actual consumer behaviour.

Given these constraints, this method appears less appropriate for the objectives in the REFRESH project. An alternative, which we will explore, is to ask participants to make photographs which are then content-analysed. Although there is no observer present when the wasting occurs, and this strictly falls under the self-report measures, it contains some of the elements of in-home observation as well.

5.5.4   Waste compositional analysis

Opinions on waste compositional analysis appear to differ, with it both being advocated as providing an accurate measurement of waste with less bias, and it being opposed to as giving an underestimation due to the neglect of liquids and the composting of food waste. Probably this is due to the objectives that people have in mind when thinking of waste compositional analysis. Waste compositional analysis may on the one hand be a very accurate measure to quantify solid waste streams collected by municipalities and on the other hand be not very accurate in quantifying all food waste from a home. Importantly, waste compositional analysis requires specific knowledge and can only provide limited information about the consumption life-cycle stages.

The conclusion is thus that a full waste compositional analysis is less appropriate for the objectives in the REFRESH project, given the central focus on the consumption life-cycle.

5.5.5   Self-collection of in-home waste: Kitchen caddies

Kitchen caddies have been used less frequently, both in prior studies and by the experts that were interviewed. Nonetheless, the experts appear generally positive about this method, especially the detailed level of information that is provided. The experts also indicated several pitfalls such as the effort required from the researchers. Taking this in mind, this method would be relevant to examine further.

To conclude: selection of measurement methods for study 2.

Reviewing the advantages and pitfalls of the measurement methods discussed above, the following 4 methods were selected for the next step.

1. survey

2. diary

3. photograph coding

4. kitchen caddies

The main selection criteria were the suitability to provide quantitative insights on consumer food waste in various stages of the consumption life cycle, and for various product categories.

6 Study 2: Pilot to operationalize measurements

6.1 Objective of Study 2

In order to optimise the operationalisation of the main study, 4 pilots were carried out in study 2 for the selected, potentially relevant methods for food waste measurement: survey, diary, photograph coding and kitchen caddies. In the pilots, these methods were tried and tested on a small scale in order to further optimize the operationalization, including clarity of instruction to the participants, formulation of questions, organisation of logistics, etc. The input collected was used to adapt the operationalisation for the main study.

6.2 Approach of Study 2

6.2.1 Operationalisation of concepts

The main concepts that needed operationalisation for appropriate measurement of food waste in the context of our research are (1) the consumption life-cycle stages for food waste and (2) food categories related to the questions on when is food wasted, and what types of food are wasted?

The operationalisation for the piloting study is explained below.

Consumption life-cycle stages for food waste

In our prior publication for the REFRESH Project (Van Geffen et al., 2016 "Causes & determinants of consumers food waste") a theoretical framework was developed to investigate consumer food wasting behaviours. This framework includes an explanation of the consumption life-cycle stages where food waste is generated in households. It is important to distinguish these stages to gain insight in drivers, causes and subsequent intervention options to change consumer behaviour to reduce food waste in households. These stages are used within this study and are further elaborated below.

The following stages were used:

1. Unprepared food that has not been used at all (e.g. unopened product, mouldy apple)

2. Unprepared food left after part of the food product has been used, thrown from storage (e.g. half a bottle of milk)

3. Food waste occurring during preparation of food (e.g. half an onion not used in the preparation of a dish)

4. Leftovers from meals, thrown away directly after the meal (without any storage)

5. Stored leftovers that are thrown out

6. "Don't know": participants had the opportunity to choose this option, and where subsequently asked for a more detailed description of the food waste (the photograph coding group did not have this option and were forced to select a category).

In all groups except for photograph coding (where this was coded beforehand and not based on photos made by the participants themselves), participants indicated the amount of waste per stage, either by noting it in the diary or survey, or by putting it in separate kitchen caddies. For the photograph coding, coders were used to provide an indication when the food became wasted. For the kitchen caddies, liquids were collected in a separate container from the solid food waste.

Food categories

Participants and coders also indicated the food categories from which the waste occurred. The following categories were used, based on prior research reporting in WRAP ("Household food and drink waste in the UK", 2012), Visschers et al. (2016), and Langley et al. (2009):

1. Vegetables (including salad)
2. Potatoes and potato products
3. Fruit
4. Drinks
5. Meat and fish
6. Bakery products (bread, rolls, sweet and savoury bakery products)
7. Dairy and eggs
8. Meals (home cooked or pre-prepared)
9. Other

For the survey, the food categories were further subdivided in 20 categories, splitting the 8 categories above in greater detail (e.g. vegetables were divided into fresh and preserved vegetables; meat and fish divided into meat, meat replacers, and fish), to help participants in remembering food waste instances.

6.2.2   Participants and design

30 Participants were invited to the pilot study. They were recruited from the existing consumer panel of Wageningen Food & Biobased Research. They received 30 Euro in reward for participation.

All participants received and answered the survey. To save space this survey is not included, however was very close to the final survey in the main study (see Annex 9).

The survey included questions on how often various foods (20 categories) were eaten in the household. The categories were based on the 8 food categories (e.g., both fresh and preserved vegetables were included for the vegetable category). Answers were given on a 7-point scale with answer categories ranging from daily

to (almost) never. Participants were asked if the question was clear and if they had any doubts about the correctness of their answer (on 100-point slider scales). Additionally, an open-ended question gave room for remarks. For explanatory texts, participants were also asked whether the text was clear, and room was given for remarks here as well.

For each of the categories where participants had indicated that the product was consumed by the household, a follow-up question was asked regarding the proportion of the food that is wasted. For each of the waste stages, participants could indicate whether this proportion was nothing, almost nothing, less than a tenth, more than a tenth but less than a quarter, more than a quarter but less than half, or more than half.

The group of 30 participants was then divided in 3 groups to assess the three other measurement methods:

1. **Food waste diary**. A shortened diary was used, with participants indicating for each occasion that food was wasted 1) the type of food that was wasted (from a pre-set list of categories), 2) the stage at which it was wasted, and 3) the amount in grams that was wasted. Participants were provided with weighing scales. They also received a separate page on which the stages (red background) and categories (blue background) were indicated. The colours corresponded to coloured columns in the diary in which food waste was to be recorded.

2. **Photograph coding**. Participants photographed the food that they wasted, and e-mailed it. Photographs were content-analysed by two independent coders to determine the type of food and the stage at which it was likely wasted, as well as estimate the weight. Participants received a ruler to be placed next to the photographed food, to enable coders to assess size more easily.

3. **Kitchen caddies**. Participants discarded their food waste in the kitchen caddies. A separate caddy was provided for each of the 6 stages at which food could be wasted (explained in section 6.2.2). The caddies were colour-coded with stickers, and rubbish bags with the same coloured stickers were provided. Participants weighed the rubbish bags from the caddies themselves, except for two in-home visits during which the researcher weighed the food waste from the rubbish bags. After weighing, rubbish bags were replaced by new bags.

6.2.3 Procedure

Participants were divided across the three measurement groups. They received a general instruction, explaining the purpose of the study. The instruction indicated what was considered as food waste (i.e., food brought into the home with the objective of being eaten by humans, which is discarded of).

In situations where participants give food waste to animals or use it in home composting, they were asked to also include this in the study. That is, they would write it down in the diary, make a photograph, or weigh the rubbish bags contained food waste from the kitchen caddy, before disposing of the food,

regardless of whether the food would be ultimately disposed of in a bin, animal feeding dish, or compost pile.

Only food waste occurring within the home was included in the study, so out-of-home food waste was not to be reported.

All participants first received the survey to be filled in online, at home. In open questions, they were also asked about whether the questions were clear and easy to fill in, and any suggestions for improvements of the question formulation.

Next, participants received instructions on the relevant food waste measurement method that was going to be used. Instructions contained pictorial explanations in addition to text, examples of how the method should be used, and a frequently asked questions section for further instruction (Annex 6 provides the instructions used in the main study, which are comparable). Participants subsequently used this method for a period of one week (7 days).

6.2.4 Post-study evaluation of the methods

After the piloting week, all participants were contacted individually by phone or in person, and were asked about their experiences with the method they have participated in, in a semi-structured interview. The semi-structured interviews all addressed the following topics, albeit in different order and specific terminology:

1. How effortful it was for them. Any issues or problems encountered using the method.

2. In the caddy group, whether self-weighing or having the researcher come and weigh felt more or less effortful and intrusive to them.

3. The extent to which it would be effortful to include waste outside of the home in the measurement.

4. Whether they felt inclined to not report certain food waste, due to the hassle involved (or for another reason).

5. Whether they felt an urge to postpone wasting food until after the study was done.

6. The extent to which they feel that the study itself made them more aware of their own food waste.

7. The extent to which they felt an urge to change their behaviour, during or after the study.

8. After being shown the survey questions from the beginning of the study, whether they think their answers to the survey were accurate.

To prevent socially desirable answers, interviewing techniques were applied to reduce this bias. These were drawn from the WRAP study on household food and drink waste in the UK (2014, questionnaire included in the annex of that report). E.g. "Some people who did the diary have said that they did not record all of their food and drink waste during the week or their behaviour changed for a number of reasons".

6.3 Results and discussion of Study 2

This section provides an overview of the findings from the piloting phase of the research, starting with overall findings and then elaborating on specific feedback from the 4 measurement methods.

6.3.1 Amount of food waste

Several participants commented that the amount of food waste that they had varied substantially across the days included in the pilot. This was also apparent in the reported waste levels: several participants reported days with zero waste and days with several hundred grams of food waste (up to 580 gram on a single waste occasion).

Given this high variance, assessing food waste across several days appears needed. Measurement on any single day is unlikely to be a reliable measure for general food waste levels. Participants themselves indicated little fatigue with the measurement, so measurement across multiple days seems both appropriate and feasible.

A similar high variance in reported food waste was visible across households. Reported food waste ranged from a total of 0 grams to 2162 grams during the measurement period.

Given this high variance across households, a study that compares different measurement methods would need to either have a large sample size (for between-subject measurement) or use different measurement methods on the same sample (within-subject measurement).

In our main study (Section 8), we have opted for the latter.

6.3.2 Instructions

Several participants indicated that the instructions were elaborate and required detailed reading. At the same time, participants also mentioned that the instructions clarified the procedure for them, and were very helpful. Based on these responses, the instructions were deemed appropriate for further use in subsequent studies.

In the main study, we amended the exact text of the instructions to account that participants used multiple measurement methods simultaneously (see Annex 6, main study, for more details on wording of instructions).

6.3.3 Waste stages

Across the measurement methods, no problems with the waste stages became apparent based on the participants' responses. No missing stage was reported, and although some participants indicated that understanding the waste stages was not always easy (in the survey), they were able to use them.

To simplify the use of the waste stages in the survey, participants suggested that examples of the specific food category in each of the waste stages would be helpful.

We took up this suggestion in our main study in which we describe waste stages and food categories in detail (see Annex 7).

6.3.4 Product categories

When asked whether they wasted food that was not included in our list of food categories, participants pointed to cookies, crisps, candy, and sauces as missing categories. They also indicated several specific food items (e.g., wraps, meat replacers) for which they felt it was unclear into which category it would fall. Moreover, participants indicated that the category of "meals" was confusing, as meals typically would consist of food items from the other categories. Participants were consequently confused as to where they should place certain food items.

Based on these remarks, we adjusted the product category list, dropping the "meal" category and adding "soups and sauces" and "sweets, biscuits, snacks, crisps, and nuts", leading to the following categories:

1. Vegetables (fresh / pot / tin / freezer)
2. Fruit (fresh / pot / tin / freezer)
3. Potato and potato products (fries, precooked small potatoes, etc.)
4. Pasta and rice (including wraps, couscous, etc.)
5. Meat, meat replacers, and fish
6. Bread, sandwich filling (sandwich meat, sweet sandwich filling, slices of cheese, etc.) and breakfast cereals (muesli, granola, porridge, etc.)
7. Dairy products (yoghurt, custard, etc.), cheese, and eggs
8. Soups and sauces (ketchup, mayonnaise, cocktail sauce, etc.)
9. Candy (pieces of candy, chocolate bars, etc.), biscuits, snacks, crisps, and nuts
10. Drinks (milk, juices, soda, alcoholic drinks; this does NOT include water/tea/coffee/syrup).

6.3.5 Survey measurement

In the survey, the measurement of food waste was based on a proportional scale (i.e., proportion of the food bought that is wasted). Participants indicated difficulty in answering on this scale. Moreover, this scale is not directly comparable to the other food waste measurements, which are at an absolute rather than a relative level.

For these reasons, we decided for the main study to use an absolute measure for the measurement of food waste in a specific week. This will be elaborate upon in more detail in forthcoming Section 8.2.5. and Annex 9.

6.3.6 Photograph coding

The photographs that participants provided were assessed. Most of the photographs clearly depicted which food was wasted. The ruler on the placemat that was used to assess size was not always clearly readable, and only provided clear feedback on one dimension as photographs had an often distorted horizon. To assess size more clearly, a placemat with rulers on two dimensions could be a better option (and we used this in the photograph study and the main study).

To facilitate coding of food waste based on photographs, a list of the average weight of various food products appeared essential. This allows for more reliable coding. Validity of the coding could not be assessed in this study, as no objective weight of the photographed food was available. As the method proved promising, it was decided to further assess its validity in study 3, described in chapter 7.

6.3.7 Diary

The diary method itself was positively evaluated by participants. The colour-coding that was used to indicate states and categories was helpful, as was the provision of these states and categories on a separate paper.

6.3.8 Kitchen caddies

The study provided several practical insights in the use of kitchen caddies, regarding stickers to indicate states on the caddies and the waste bags, amount of time needed to provide materials to household, amount of time needed to weigh the waste bags. Overall, use of this measurement appears possible for small samples, but practical limitations are clearly present when applying it to a large sample.

7 Study 3: photograph coding

7.1 Objective of study 3

The objective of this study is to assess the validity of coded photographs of food waste for the measurement of food waste levels. To assess this, we used photographs of model food waste components, which were constructed to vary on specific factors. The food on these photographs was precisely weighed such that coding of the amount of food waste could be compared to actual objective weight measurements.

7.2 Approach of study 3

7.2.1 Selection of food categories

In order to assess food waste across a large variety of relevant product categories, we used the photographs and diary entries of Study 2 to gain insights in the types of food products that are most often wasted. This resulted in the following selection:

1. Pasta in a pan
2. Bread on a plate
3. Mixed meal (meat, potatoes, vegetables) on a plate – separately assessed
4. Raw vegetables in a plastic bowl
5. Fruit in a glass bowl
6. Bread in a basket
7. Leftover pasta in a plastic box
8. Dessert in a glass bowl
9. Soup in a pan
10. Liquids in a mug
11. Potatoes on a plate

7.2.2 Manipulation factors

Volume and size

Because the weight of a substance depends on both volume and density, we structurally manipulated both the volume and the density of the chosen food in each of these categories. For volume, we expect that photographs with a high volume of food will show more deviation in coded weight (grams) from actual weight than photographs with a low volume of food, simply because estimates of low amounts of food have a natural limit (zero grams) that is absent for estimates of high amounts of food.

Given that density is more difficult to assess on a photograph, we expect that the coded weight from the photographs will respond less strongly to these differences in density than to differences in volume. This lower response to density should be especially present when the chosen food products are physically very similar (e.g., two different types of custard dessert), whereas a larger response in coded weight should be observed when the chosen food products are physically dissimilar (e.g., salad vs. carrots).

To manipulate volume, we photographed small (few spoons, bread crusts, etc.) versus large (single-serving size, several slices of bread, etc.) volumes of food. To manipulate density, we used different types of products within each of the categories: carrots versus lettuce for raw vegetables, pear versus peach for fruit, dense versus 'lighter (weight)' bread, dessert with whipped cream versus a fluffy-whipped dessert, etc.

Container size

Not only the food itself affects the amount that is coded, it is expected that the container in which it is presented in the photograph has an effect as well. There is ample prior research (e.g. van Ittersum & Wansink, 2012; Wansink, 2004; Wansink & van Ittersum, 2003; Raghubir & Greenleaf, 2006) that conclude that the size of a plate, glass or other container can lead to optical illusions whereby volume estimates are systematically biased, even by experts. To assess this in the current context, we structurally put food into either relatively small or large containers (plates, pans, mugs, etc.). Given that we provide ruler indications, in the form of a coloured checkered pattern, on a placemat in each of the photographs, we expect that deviations due to container size will be relatively minor in the current context.

7.3 Design of study 3

The study had a 2 (volume) x 2 (density) x 2 (container size) factorial design, applied to 13 foods, namely the 11 food categories mentioned above with the mixed meals separated out into its three components (meat, potatoes and vegetables). Because the photos of the mixed meals contained 3 food items, which were separately estimated, this led to 88 (8 x 11 food categories) separate photos of 104 (model) food waste items (8 x 13 foods). Annex 8 provides an example of the photographs that were used. The food items in the photos were carefully weighed beforehand to know their actual weight.

Two independent coders, who were unfamiliar with the study setup, then estimated the weight of each of the food items on the photos. To aid the coding exercise, the coders were asked to construct lists of standard food weights based on information collected online before the coding (without knowing which food would be on the photographs), e.g. the standard weight of 1 apple (an example reference source is www.hoeveelweegt.nl). The coders were also instructed to try and find weight measurements for food items online as reference points throughout the coding process. The coders additionally practiced on the photos obtained from the pilot study to align coding.

7.4 Results of study 3

7.4.1 Differences in actual food weight

Before examining the validity of the weight estimates, we first examined the actual objective weights of the food in the photos. Actual weight differed between 4 and 822 grams, with an average of 123 grams (SD = 165). The full pans of soup and full loaf of bread were the heaviest items in the range, and especially the soups were considerably heavier than the other food items in the photos.

As container size was manipulated without changing the actual weight, we furthermore ran an analysis of variance (ANOVA) with volume, density, and product category as independent factors and actual weight as the dependent variable. In a first model, we only included the main effects. We were mainly interested in the effect sizes of the factors that we structurally manipulated to affect actual food waste. Results showed that the effects of volume ($F(1, 89)$ = 81.24, $p < .001$, η_p^2 = .48) and food category ($F(12, 89)$ = 9.65, $p < .001$, η_p^2 = .56) were considerably stronger than the effect of density ($F(1, 89)$ = 5.19, p = .025, η_p^2 = .06). This implies that, in our constructed dataset, the main differences in weight were due to volume and product category, with density playing a minor role.

In a second model, we included interaction effects, which were all significant. Thus, the effect of density depended on product category (which is a result of our decision to sample foods in relatively high or low density for that category), and so did the effect of volume (which is a result of our decision to base high volume on single-serving portion sizes for that category).

Summarizing, the actual weights of the food waste items included in this study differed primarily due to volume and product category. Density also affected actual weights, but to a much lesser extent. Moreover, the size of the effect of volume and density was different for the different product categories.

7.4.2 Overall validity and accuracy

As a first assessment of the validity of the weight measures, we examined the Pearson correlation between the two coders, and between each coder and the actual weight. The correlation between both coders (interrelated reliability) was high (r = .822). The correlation between each of the coders and the actual weight was even higher (r = .881 and r = .894), indicating that, overall, both coders were able to assess relative actual weight well. When we averaged the estimates of both coders, the resulting mean estimate correlated very highly (r = .929) with actual weight. Figure 1 provides a scatterplot to visualise these results. Leaving out the product category of soup (for which the full pans were considerably higher in weight than any of the other food items) decreased these correlations, but the correlation between the average estimate of both coders and actual weight remained high (r = .914).
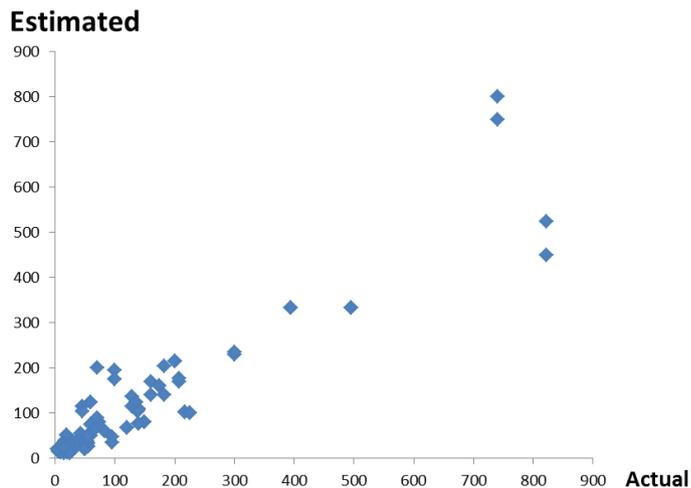
Estimated

Figure 1. Scatterplot of actual versus estimated weights (in grams)

Because a high correlation between two measures does not preclude the possibility for a structural under- or overestimation, we also assessed whether the difference between estimated and actual weight was significantly different from zero. This showed that one of the coders had a systematic underestimation of the amount of food that was shown (mean difference = -33.42 gram, 27.2 % of the average weight, $t(103)$ = -3.86, p < .001, CI = [-50.61, -16.24]), whereas the other did not (mean difference = -1.63 gram, 1.3 % of the average weight, $t(103)$ = -0.21, p = .834, CI = [-16.92, 13.67]).

7.4.3   Effect of volume, density, and container size on weight estimates

As a next step, we assessed whether the estimated weights were influenced by the factors that were structurally varied. Weight estimates should ideally depend on volume and density, and differ across product categories. Moreover, weight estimates should ideally not depend on container size.

First, we examined for each category separately whether each of the coders responded to the manipulations. In all categories, coders responded to volume, but they tended to especially underestimate large volumes for the categories of vegetables (part of a meal), potatoes (part of a meal), fruit, leftover pasta, bread in a basket, and bread on a plate. Coders tended not to respond to differences in density, even though in several product categories, product density had a relatively large effect on actual weight. This is visible in the categories of bread on a plate, dessert, fruit, meat, pasta in a pan, potatoes (part of meal), raw vegetables, and vegetables (part of meal).

To assess whether coders responded to container size, we examined this for each product category and coder separately. Table 1 provides the results. One of the coders responded more often to container size than the other coder, suggesting that training may help diminish these effects. Moreover, liquids and semi-liquids appeared to be categories in which both coders responded to container size.

Table 1. Coders' responses to container size

Response to container size	Product categories
For both coders, no response to containers size (i.e., equal grams reported)	Fruit
	Bread in a basket[*]
	Meat[*]
	Potatoes (part of meal)[*]
	Raw vegetable
	Vegetable (part of meal)[*]
One of the coders responds to container size, the other does not	Bread on a plate
	Leftover pasta
	Pasta in a pan
Both of the coders respond to container size	Dessert
	Liquids
	Soup
	Potatoes (for sautéed potatoes (light density) only)

[*] *With the exception of high density food in small volume, for one of the coders*

Table 2 provides an overview of the actual mean weights, depending on the manipulated factors, and the estimated mean weights. In an ANOVA, we assessed whether the estimated weight (averaged across both coders) responded to volume, density, container size, and food category more formally. We included all main effects and 2-way interactions in this model. The main effect of product category was significant ($F(12, 49) = 131.49$, $p < .001$, $\eta_p^2 = .97$), as was the interaction between product category and volume ($F(12, 49) = 86.73$, $p < .001$, $\eta_p^2 = .96$). More relevant for our investigation are the effects of volume, density, and container size. Ideally, volume and density should affect the coded amounts, and container size should not. Results show that volume indeed influenced the estimated weight ($F(1, 49) = 1061.05$, $p < .001$, $\eta_p^2 = .96$), with higher estimated weight ($M = 170.48$ grams) for large volumes and lower estimated weight ($M = 37.58$ grams) for small volumes, as would be expected.

Table 2. Means actual weights compared to estimated weights (averaged across both coders), in grams, depending on manipulated factors

	Actual weight	Estimated weight
Low volume	36 (25)	36 (30)
High volume	210 (198)	174 (159)
Low density	101 (154)	107 (155)
High density	145 (174)	104 (109)
Small container size	123 (166)	109 (139)
Large container size	123 (166)	101 (129)

Note: Standard Deviations (SD) provided between brackets.

Food density did not significantly affect the estimated weight ($F(1, 49) = 0.36$, $p = .550$, $\eta_p^2 = .01$). In line with our expectations, differences in food density within a category did not substantially influence weight estimates, probably because such differences are hard to assess using only pictorial information. There was a significant interaction between density and product category, however, indicating that this lack of effect was not universal ($F(12, 49) = 15.99$, $p < .001$, $\eta_p^2 = .80$). Follow-up planned contrast analyses showed that density had an effect on weight estimates for the categories of leftover pasta, liquids, potatoes on a plate, and soup only.

Container size also did not significantly influence the estimated weight ($F(1, 49 = 3.15$, $p = .082$, $\eta_p^2 = .06$). Thus, coders were generally not responsive to the size of the container, which should allow for accurate coding. The interaction between container size and product category was not significant, although the overview for product categories separately showed that coders did respond to container size for (semi)liquids. None of the remaining interaction effects in this model were significant in the ANOVA.

7.4.4 Weight estimates of the two coders

To assess the extent to which the two coders differed in their coding of the weights, repeated measures ANOVA was performed. The two coders were treated as repeated measurements, and as before, the four manipulated factors as well as all two-way interactions were included in the model. We were especially interested in any interactions with the repeated measures factor. Results showed significant effects for several such interactions: coder * category ($F(12, 49) = 2.40$, $p = .016$, $\eta_p^2 = .37$), coder * volume ($F(1, 49) = 14.35$, $p < .001$, $\eta_p^2 = .27$, coder * category * density ($F(12, 49) = 1.98$, $p = .047$, $\eta_p^2 = .33$), and

coder * category * volumes ($F(12, 49) = 2.90$, $p = .004$, $\eta_p^2 = .42$). These effects are smaller than the between-subjects effects that we find without the coder interaction (foodtype $\eta_p^2 = .97$, volume $\eta_p^2 = .96$). This suggests that although there are differences between the two coders, the differences between categories and volumes mattered more.

7.4.5 Effect of volume, density, and container size on under- and overestimation

Subsequently, coders' tendency to over- or underestimate the weight of the food was assessed by taking the difference between estimated and actual weight as a dependent variable (positive values indicate overestimation). For estimated weight, the average estimate of both coders was used. Volume, density, container size, and food category, as well as all 2-way interactions, were again the independent variables in this analysis.

The effect of food category was significant ($F(12, 49) = 13.01$, $p < .001$, $\eta_p^2 = .76$), as was the interaction between food category and volume ($F(12, 49) = 11.15$, $p < .001$, $\eta_p^2 = .73$), and the interaction between food category and density ($F(12, 49) = 13.91$, $p < .001$, $\eta_p^2 = .77$). This indicates that there are differences in under- versus overestimation across the product categories. To explore this further, Figure 2 provides a graphical display of the differences between estimated weight and actual weight for each of the categories.
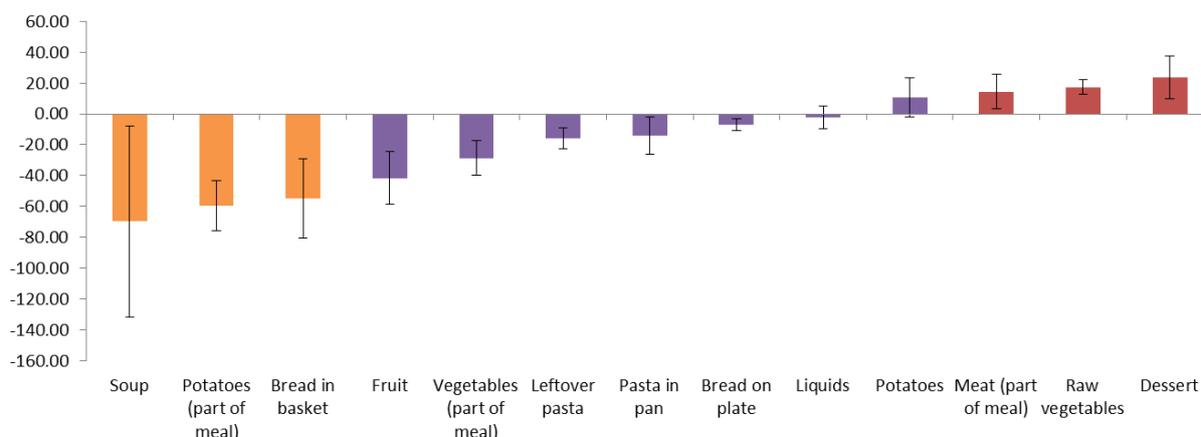
Note: Error bars represent Standard Errors of the Mean (SE).

Figure 2. Differences between estimated weight and actual weight (in grams), per product category

The category of soup appears as the most difficult to assess, with coders tending to underestimate the amount. This could be due to the use of (deep) pans, for which the height may have been difficult to assess on the picture.

Figure 3 shows the mean differences between actual and estimated weights according to density and volume. Results of the ANOVA furthermore showed a

significant overall mean ($F(1, 49) = 53.52$, $p < .001$, $\eta_p^2 = .52$), which was negative ($M = -17.52$), indicating that the coders tended to underestimate the food weight. Moreover, there were main effects of food density ($F(1, 49) = 93.93$, $p < .001$, $\eta_p^2 = .66$) and volume ($F(1, 49) = 55.89$, $p < .001$, $\eta_p^2 = .53$), as well as their interaction ($F(1, 49) = 41.38$, $p < .001$, $\eta_p^2 = .46$). Especially the weight of foods with high volume and high density was underestimated. This confirms that coders had difficulty responding to food density.
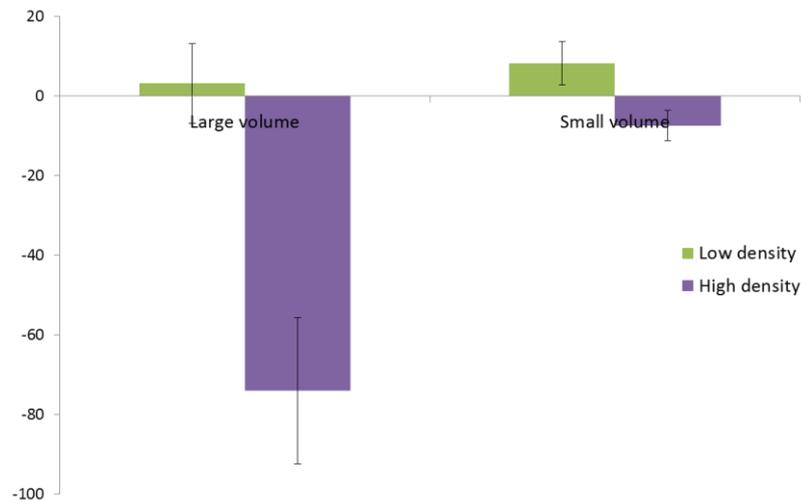
Note: Error bars represent Standard Errors of the Mean (SE).

Figure 3. Effects of food volume and density on coder under- and overestimation (in grams)

Results furthermore showed no main effect of container size ($F(1, 49) = 2.46$, $p = .123$, $\eta_p^2 = .05$), and no significant interactions of any of the factors with container size. This again shows that coders generally did not respond strongly to the size of the container in which the food was kept in their coding of food waste on the photographs, which is good.

7.4.6 Effect of volume, density, and container size on accuracy

The accuracy of the coding was assessed by taking the absolute difference between the estimated and actual weight as the dependent variable. The manipulated factors of volume, density, container size, and food category, as well as all 2-way interactions, were again the independent variables in this analysis.

The effect of food category was significant ($F(12, 49) = 5.27$, $p < .001$, $\eta_p^2 = .56$), as was the interaction between food category and density ($F(12, 49) = 3.01$, $p = .003$, $\eta_p^2 = .43$). This indicates that there are differences in accuracy across the product categories. Further examination showed that soup was the category with the highest values: it had the least accurate estimates. Potatoes as part of the meal, bread in a basket, and fruit came next.

Results of the ANOVA furthermore a relatively small main effect of food density (F(1, 49) = 5.07, p = .029, η_p^2 = .09), as well as a main effect for volume (F(1, 49) = 37.54, p < .001, η_p^2 = .34). Their interaction was significant as well (F(1, 49) = 5.09, p = .029, η_p^2 = .09). Coders were less accurate for foods with high density (M = 45.64) than for foods with low density (M = 29.02), and for foods in high volume (M = 59.95) than for foods in low volume (M = 14.71). Furthermore, effects of density were only present for foods in large volume and not significant for foods in small volume. The small volume of foods made density less influential on weight, also in the actual weight measurements.

Overall, this shows that coders did not respond very strongly to food density, which especially decreases their accuracy when foods are offered in high volume.

7.5 Discussion

Overall results indicate that these two coders are well able to estimate the relative differences in weight of pretend food waste, as shown by a high overall correlation with actual weight. An averaged estimate from both coders correlates even more highly with actual weight. This implies that using multiple coders to assess food weight from photographs is advisable.

We furthermore find a systematic underestimation of the amount of food that is wasted for one of the two coders. The same coder also responds more often to container size than the other coder. We therefore advise future research to train coders by letting them provide estimates for known weights of (wasted) food. In that way, systematic under- or overestimation, as well as responses to container size, can be detected and coders can be trained to avoid this.

The coders are generally less accurate for large volumes of food products – where underestimation took place – than for small volumes of food products. This is in line with our expectations: larger volumes are more difficult to assess correctly than smaller volumes, and do not have a natural boundary to their weight (i.e., small volumes have the boundary of 'zero' weight).

Coders moreover show evidence of not responding adequately to the density of food products. They are more inaccurate for high than for low density food products. Although food density resulted in less variance in actual weight than volume, such that a lower responsiveness of the coders is to be expected, the lack of effect of density on estimates of food weight for most product categories shows that density can be difficult to assess with only visual information on the photographs. This implies that future research is advised to construct a detailed list of the weights of various types of foods, within the broader categories, to be used as a guideline during the coding procedure. This should be especially helpful when large differences exist between products within a category, and can aide coders in making better estimates across high and low density food products.

In the coding of food waste, we find that food in small containers is often coded with similar weight as the same food in large containers, despite prior research that has shown that container size affects estimates of volume (and thereby amount). The use of ruler indications, in the form of a coloured checkered pattern on the placemat that was used in every photograph, may have been helpful in

avoiding optical illusions. Future research is needed to further assess the helpfulness of the placemat, but based on our results, we recommend its use. Moreover, the categories in which coders systematically respond to container size concerned (semi)liquids such as drinks, soup, desserts. Research using coded photographs to assess food waste should thus keep in mind that coding of such (semi)liquids may be less accurate due to container size effects.

In our study, we have aimed to test the validity of photographic coding under controlled circumstances. Coders can check the average weight of food products in online resources, placemats are used to give the photographs a standardized context through which coders can assess accurate sizes, and care is taken to ensure that the food items in the photographs were in focus and clear. More research is needed to examine the validity of measures based on the coding of photographs under less optimal circumstances. Furthermore, future research could examine the effects of coders' training on performance and also the extent to which individual coders may differ in their level of accuracy.

8 Main study – comparison of diary, survey, photograph coding, and kitchen caddy

8.1 Objective of the main study

The objective of this main study is to assess the validity of four distinct methods of food waste measurements – diary, survey, photograph coding, and kitchen caddy. Validity will be assessed by applying all of these methods (or sometimes a subset thereof) to the same instance of household food waste and calculating the extent to which the measures are related in terms of distinguishing between people who waste more and people who waste less food. It thus focuses on the convergent validity of these various methods. In addition, we will examine the average amount of waste recorded by the different measures, to assess potential underreporting from these measurement methods.

8.2 Method of the main study

8.2.1 Design of the main study

Given the large variance that was noted in the pilot study (see Chapter 6) in food waste generated across persons, using a between-subjects design in which different waste measures are used for one group of persons than for another groups of persons would require a large sample size. Even if we would apply different measures in one day/week than in another day/week for the same person, variance in food waste across days is so large that this would likewise require a large sample. Therefore, we opted for a within-subject design in which amounts were measured for the same food waste instances, using each of the different methods.

Having all participants use all of the methods was not possible / advisable for two reasons. First, kitchen caddies and photograph coding present logistical and practical challenges, and therefore only a subgroup of the sample will be equipped with kitchen caddies and asked to take photographs. Second, the measurements themselves could be influenced by the other measures that are taken. Survey questions are probably most sensitive to disruption due to the other measurements. That is, asking people to note waste occasions in a diary / throw waste in a caddy / take a picture may influence each other a little when taken in combination, but we expect this influence to be minimal. That is not the case for the survey questions. Noting things in a diary or taking pictures is likely to heighten the awareness to food waste and influence survey questions. Therefore, overall survey measures of food waste in general (not related to the study weeks) were asked at the beginning of the study, to eliminate this influence. Furthermore, we decided to include a group in the design in which people have one week in which only the self-reported survey questions on food waste in that week is measured and one week in which all measures are taken. The correlation in the survey measures between these two weeks can then be compared to the correlation of a group of people who employ all measures in both

weeks, to assess the extent to which using the other measures influences the survey. A large difference in correlations would cast doubt on the reliability of using the survey measure by itself, or could be taken as an indication that the other measures influenced behaviour itself.

The considerations detailed above led to the final study design that is presented in Table 3. All participants first filled in overall waste assessment questions. One group of participants subsequently provided information on all measurement methods for a period of two weeks. Another group provided information during the two weeks using the diary and survey (but not the kitchen caddies and photographs), and a final group did not use the diary in the first week. This final group was sensitized to the topic and aware that they would be asked to report on food waste after the first week.

Table 5. Study design

Group	Initial measure	Week 1	End of week 1	Week 2	End of week 2
I	Survey: overall waste assessment (n = 48)	Diary	Survey: assessment of waste in the past week	Diary	Survey: assessment of waste in the past week
II	Survey: overall waste assessment (n = 48)	-	Survey: assessment of waste in the past week	Diary	Survey: assessment of waste in the past week
III	Survey: overall waste assessment (n = 47)	Diary, kitchen caddy, and photographs	Survey: assessment of waste in the past week	Diary, kitchen caddy, and photographs	Survey: assessment of waste in the past week

8.2.2 Participants

Participants were members of the existing consumer panel of Wageningen Food and Biobased Research. The database consists of over 2000 people aged between 18 and 95 years, who are interested to participate in consumer research. Panel members were recruited in the past by mailings, flyers, newspaper advertisements or introduced by other panel members. Members aged between 18 and 80 years were invited for this project by e-mail.

Panel members were first contacted with a screening questionnaire. They were asked for name, gender, date of birth and household composition as background information. Next, they were asked about the prevalence of food waste in their

household by the question "how often on average are food products thrown out in your household", with nine answer categories ranging from daily to (almost) never. Panel members who indicated that food waste occurs (almost) never in their household were excluded from participation, to increase the likelihood that food waste occurs and would be reported during the study period. Panel members were also asked whether they were employed in the food sector or by Wageningen University, and a positive response to either of these questions would exclude the household from participation in the study.

Furthermore, panel members were asked whether they are in the possession of a kitchen weighing scale and a smartphone or tablet, as these would be needed in order to weight food waste and e-mail photographs easily. Panel members who did not own a weighing scale (only 2 persons in our sample) or smartphone / tablet were excluded from participating in group III of the study. When assigning participants to the three groups, care was taken that age, family composition, and frequency of self-reported food waste were equal across the three groups.

A final set of questions for participants in group III concerned the preferred dates on which kitchen caddies could be brought to the home and picked up again after the study, and a drop off place where rubbish bags could be picked up during the study. Address details were also collected. With this information, we were able to obtain a good geographical spread of participants, keeping in mind the logistics of the kitchen caddy group and availability of participants.

To determine sample size, we conducted power calculations. The objective of the study is to assess the correlation between different types of measures. We therefore compare H0: correlation is high enough to conclude that measurements converge, to H1: correlation is too low to conclude that measurements converge. Calculations were done in the software package G*Power 3.1.9.2. (University of Düsseldorf). Several possible values were entered to obtain a feeling for what would be an appropriate sample size. Using alpha = .05 and power = .80, H0: r = .80 and H1: r = .70 this leads to a sample size of n = 118. If we would set H0 at r = .70 and H1 at r = .60, the sample size would be 206. Based on these calculations, we decided to aim for a total sample size of around 150. For the photograph coding, measurements can be compared with the diary for each food waste instance, assuring a sizeable data set for this comparison. For the caddy, comparisons to other measurements can only be done at the week-level, and with a sample size around 50, this implies that results need to be interpreted with care. We aimed for the three groups in the design to each contain 50 participants, but due to participant drop-out we obtained slightly lower numbers (see Table 5).

Participants were predominantly female (79.7 %) with an average age of 50.1 years (range between 20 and 79 years). Households generally consisted of one (21.7 %) or two (65.0 %) adults, with some households of three (8.4 %) or four (4.9 %) adults. Of all households, 35.7 % contained one or more children. When asked about the number of household members who regularly eat the main meal at home, 20.3 % of the participants indicated that this number would fluctuate. Frequently mentioned reasons include children raised in multiple households, adult children often joining for meals, and adults regularly not joining meals due to work obligations.

8.2.3 Procedure

To recruit participants, an e-mail was distributed to the panel members of the Wageningen Food & Biobased Research database. In the invitation the aim of the project was described (to compare different methods to measure food waste). The planning and criteria were described as well and the reward for participation (40 Euro). If the participants were interested to participate they could apply by answering an online screening questionnaire.

Participants obtained detailed instructions by regular mail on how to measure food waste using each of the measurement methods, including examples of how to fill in the diary and how to take photographs. Hardcopy diary pages were provided, as well as a return envelope. Annex 6 contains the instructions (in Dutch) for the third group in the design, where all methods were applied. Instructions for the other groups did not contain information on kitchen caddies and photograph coding as these would not apply. If consumers had questions or something was not clear they could contact one of the researchers by e-mail or telephone. Participants were e-mailed a reminder at the start of the study. Participants in group III also received reminders regarding the collection of the rubbish bags. All participants signed a consent form, which was mailed to the researchers in a return envelope together with the diary.

At the end of the study, participants answered questions on the experienced difficulty with the study, and whether their awareness of food waste changed due to the study (3 items). They also indicated their perceived accuracy with which the food waste in their household was reported (3 items) and whether other household members collaborated in the study (3 items). Item wording is available (in Dutch) in Annex 9.

8.2.4 Stages and product categories

In all measurement methods, the same stages and product categories were applied. Annex 7 provides the overview (original size is one A4) that participants received listing these stages and categories.

Stages were:

1. Completely unused food: Food that has not been used at all (e.g. unopened packages, mouldy apple, dried up leek)
2. Partly used food: Food that is disposed of when it is partly used (e.g. crusts of bread, half a pack of sandwich meat, half an onion or courgette that is not used to make a dish)
3. Meal leftovers: Meal leftovers that remain on the plate or in the pan after the meal (e.g. leftover potato, rice, mashed dish etc. or leftover bread from a lunch package that comes back into the home)
4. Leftovers after storage: Leftovers that are thrown out after having been stored (e.g. leftovers that you kept after a meal in the refrigerator but do not eat after all)

Food categories were:

1. Vegetables (fresh / pot / tin / freezer)
2. Fruit (fresh / pot / tin / freezer)
3. Potato and potato products (fries, precooked small potatoes, etc.)
4. Pasta and rice (including wraps, couscous, etc.)
5. Meat, meat replacers, and fish
6. Bread, sandwich filling (sandwich meat, sweet sandwich filling, slices of cheese, etc.) and breakfast cereals (muesli, granola, porridge, etc.)
7. Dairy products (yoghurt, custard, etc.), cheese, and eggs
8. Soups and sauces (ketchup, mayonnaise, cocktail sauce, etc.)
9. Candy (pieces of candy, chocolate bars, etc.), biscuits, snacks, crisps, and nuts
10. Drinks (milk, juices, soda, alcoholic drinks; this does NOT include water/tea/coffee/syrup).

8.2.5 Measurement methods

Survey

The complete survey is provided in Annex 9 (in Dutch). In the initial survey at the start of the study, all participants answered questions on the frequency with which products from 22 categories were consumed in the household, on a 7-point scale labelled daily / multiple times per week / once per week / multiple times per month / once per month / multiple times per year / (almost) never. The product categories were constructed such that the combination of two or three of these would lead to the above-mentioned 10 general food categories used throughout the study. Next, participants answered questions on the overall in-home food waste in their household, as a relative amount (based on a study performed by WRAP; Household Food and Drink Waste in the UK, 2012), as an overall percentage of bought foods (cf. Stefan et al. 2013), and as the frequency of food waste (cf. Parizeau et al., 2015; see Table 4 for wording of the questions).

For each of the product categories that they indicated were consumed in their household, they subsequently answered questions on the proportion of the amount bought that was typically discarded. Participants also indicated in which stage most of the product category was discarded, with the ability to indicate multiple stages if these occurred equally. Examples of each specific product category were given to clarify the stages for participants (see Annex 9).

After each week, participants answered questions on the number of days that the main meal was consumed at home, and how many people were present for the main meals. They were also asked to indicate in which of the 22 categories food was discarded in the past week. For each of the product categories in which waste occurred, a subsequent question asked how much this was, in an absolute amount. Amounts were reported in relevant units for the product category (e.g. spoons of vegetables, pieces of fruit, portions of meat). Again participants also indicated which stages the food waste was from, by selecting the most appropriate stage(s).

Diary

In the diary, participants recorded for each waste instance the weight (in grams) state, product category, and if the waste was thrown in the bin (yes/no). The bin was either their own food waste bin (groups I and II) or the caddy provided for the study (group III). If waste was not thrown in the bin, participants were asked to write down in their own words what other method of disposal was used. An example sheet is provided in Annex 10. Each page of the diary contained the date and 14 lines in which participants could fill out their waste of that day. Participants used an average of 1.60 lines per day, with number of lines used per day ranging between 0 and 18.

Photograph coding

To ensure that the photographs could be interpreted easily, detailed instructions were provided on how to make photographs. Participants were asked to make multiple photographs of the same instance of food waste, if this would lead to easier viewing of amount or type of waste. Moreover, participants received a placemat (see Annex 11), with the request to place all food waste on this placemat before taking a photograph. The checker patter on the placemat (each 2 cm wide) allowed coders to have a clear and easy indication of size on each photograph. On each placemat, the household identification number was indicated on the front in large black numerals, and the placemat was subsequently plasticized.

Kitchen caddies

The kitchen caddies consisted of two bins with two compartments each. Each compartment was labelled with a state, by a clear sticker on coloured paper. The sticker contained the name of the state and drawings of examples of products (see Annex 12). Participants were provided with waste bags containing the same stickers. Weighing was done by the researchers, who picked up the waste bags. Weighing occurred every two or three days, and weights can be aggregated for each of the two study weeks. When participants did not throw away food in any of the compartments, they were asked to hand in the empty waste bags nonetheless and replace these with new bags at each weighing moment.

Table 4 provides the various measures that were used in this study.

Table 4. Measurements in the main study

Method	Measure	Description	Observation unit	Measurement unit
Survey	Overall waste assessment	How much uneaten food, overall, would you say you generally end up throwing away of the food that is bought in your household?	One estimate per household	Quite a lot / a reasonable amount / some / a small amount / hardly any / none
Survey	Overall waste assessment	Which percentage of the food that is bought in your household is discarded?	One estimate per household	none / 5% or less / 6% to 15% / 16% to 30% / 31% to 50% / more than 50%
Survey	Overall waste assessment	How often is food discarded in your household?	One estimate per household	Regularly / sometimes / infrequently / never
Survey	Assessment of overall waste per product category	Which proportion of {product category} is discarded of what is available in your household? In which state falls (the majority of) the {product category} that is discarded?	One estimate per household for each product category and split into states	Nothing or does not apply / Almost nothing / about a tenth / about a quarter / about half / more than half
Survey	Assessment of waste in the past week	How much {food category} was discarded in your household in the past week	Estimates per household, for each study week. Waste assessed per product category, and split into states	Scales based on units that are appropriate for the category
Diary	Self-reported amount in diary	Weight reported in the diary	Estimate per waste occasion; product category and states indicated	Grams
Photos	Content-analysis of photos	Weight assessment based on photos	Estimate per waste occasion; product	Grams

			category and states also coded	
Kitchen caddies	Weighed amount from kitchen caddies	Weight of the food waste from kitchen caddies	Estimates every couple of days (aggregated to weeks). No information on product categories. States included.	Grams

8.3 Results of the main study

8.3.1   The individual measurement methods

Survey – assessments in the initial questionnaire

As can be seen in Table 5, the three questions related to overall waste assessment resulted in relatively little variance across participants. Most participants (over 80%) indicate that they waste a small amount or hardly anything; that they waste either 5% or less or between 6% and 15%; and that throwing away food occurs sometimes or infrequently. This low variance across the answer options already indicates that it may be difficult to disentangle differences between participants when such general questions are used.

Table 5. Answers to questions on overall waste assessment

Item	Answer categories	n	%
How much uneaten food, overall, would you say you generally end up throwing away of the food that is bought in your household?	Quite a lot	0	0
	A reasonable amount	9	6.3
	A small amount	71	49.7
	Hardly any	62	43.4
	None	1	0.7
Which percentage of the food that is bought in your household is discarded?	None	1	0.7
	5% or less	85	59.4
	6% to 15%	47	32.9
	16% to 30%	10	7.0
	31% to 50%	0	0
	more than 50%	0	0
How often is food discarded in your household?	Regularly	25	17.5
	Sometimes	70	49.0
	Infrequently	47	32.9
	Never	1	0.7

In the initial survey, participants were also asked to assess the overall waste in the foods that were consumed in their household, from a total of 22 possible food categories. On average, participants indicated that food from 20 of the 22 categories was consumed in their household, with 41.3 % of participants

indicating all categories. Fresh vegetables, fresh fruit, sandwich fillings, bread, and non-alcoholic drinks were the categories that were relatively often consumed by most participants, and non-fresh fruit, potato-based products such as fries, and soups were least often consumed.

Next, we assessed the questions per food category, on how much of the food that is consumed is thrown out. Across all categories, the most often provided answers are "nothing / does not apply", "almost nothing" and "about a tenth". We averaged across the categories. The average waste reported from this measure has a limited range (between 0.05 and 2.23 on a 0-5 scale, with mean of 0.75 and standard deviation of 0.36). So this scale as well shows little variance across participants.

We also assessed a weighted average waste per category, in which the proportion waste was weighted with consumption frequency for each category. We brought the scale back to a 0-5 potential range. This scale had a mean of 0.58, SD = 0.29, ranging in the sample between 0.03 and 1.79.

In conclusion, all general survey measures from the initial survey showed remarkably little variance among participants in their reported waste levels, and low overall reported waste levels.

Survey – weekly assessments

Per week, participants reported the amount of food waste per product category, in appropriate units for that category (spoons, pieces, etc.), using six answer categories for each question. Based on online information, the average weight of these units was estimated (e.g., 100 grams for a piece of fruit, 50 grams for a spoonful of pasta, 250 grams for a portion of meat). Based on these estimates, the reported units were recalculated into weights (grams). Annex 13 provides the weights that were used to recalculate the units into grams.

Analyses of these weights indicate a large variance in the amount of food waste, ranging between 0 grams in a week to 4170 grams in a week per household, with a mean of 639 grams. Self-reporting over a weekly period thus appears to lead to a more diverse range of measurement values than self-reporting using a general question on food waste.

Diaries

Diary entries were combined into reported weight of food waste per category and per state, for each household. Measures were combined at the week-level to enable comparison with other measurement methods. The average waste reported in the diaries was 1122 grams per week per household. Households varied considerably in the amount of reported waste.

In the diaries, participants also noted food waste that was not disposed of in the rubbish bin. They could write down the method of disposal that was used. The most often mentioned methods of disposing food products outside of the rubbish bin (as % of instances) were that food was given to animals (43.3 %), poured down the drain (31.4 %) or composted (22.1 %). The amount of food waste that is disposed of outside of the rubbish bin is substantial (262 grams per week on

average per household), and differs widely across participants (between 0 and 4013 grams). A large proportion of the households only reported food waste going into the rubbish bin (45.9%), but there are also 11 households (4.7%) who report that they did not throw any of their food waste in the rubbish bin.

Caddies

The rubbish bags from the caddies were collected and weighed every two or three days. Weight measures were subsequently summed to weekly weight measures, per state. The average waste collected in the caddies was 1042 grams per week per household. Here as well, we see considerable variation in amount of food waste across households.

Photograph coding

Photos were content-coded for weight, state, and product category. Weights were summed for each week. The average amount of waste coded from the photos was 933 grams per household per week.

Based on the photos and diary entries, a total of 1010 waste occasions could be identified. Photos and diary entries were linked together based on household number, date, category, and amount. There were more waste occasions with a diary entry and missing photo (129) than photos without corresponding diary entry (7).

Next, we compared the reported weight from the diaries to the coded weight from the photos. We found a strong correlation of $r = .73$ after excluding one coding mistake. There was no evidence of under- or overestimation of the weights (paired-sample t-test: $t(775) = -0.15$, $p = .885$).

Weights for each of the measurements

Summarizing, Table 6 provides the reported waste levels for each of the measures, and Figure 4 shows a visual illustration of the reported amount of waste in each of the stages for the various methods. As can be seen, the highest amount of reported waste occurs for the diary method, and the lowest amount for the survey. This supports the notion that survey measurement leads to underreporting.

The highest amount of food waste (in terms of weight) occurs for vegetables, fruit, and bread / cereals. The lowest amounts occur for candy / snacks and meat and fish. This order of food categories is mostly consistent across measurement methods.

Results from the weighted index from the initial survey deviate somewhat with respect to the relative amounts of food waste in the product categories and in the states compared to the other measurement methods. Coupled with a low reported variance in food waste from this measure, the assessment of overall waste per product category appears less suitable to provide insights into in-home food waste.

Table 6. Amount of reported waste for each of the methods

Measure	Survey (weighted index)	Survey (weekly amount)	Diary	Caddies	Photos
Overall average (per week)	0.58	639 (573)	1122 (1086)	1042 (811)	933 (788)
Average week 1		614 (579)	1076 (904)	1055 (763)	971 (865)
Average week 2		662 (568)	1154 (1196)	1029 (865)	893 (708)
Minimum (per week)	0.03	0	14	0	0
Maximum (per week)	1.79	4170.0	7213.0	3216.0	4070.0
Vegetables	5.39	98.4	232.2		207.0
Fruit	4.26	103.4	196.4		146.0
Bread and cereals	4.72	117.7	189.4		157.8
Potatoes	3.79	53.1	112.5		63.9
Pasta and rice	4.18	69.7	97.0		86.9
Dairy and eggs	2.63	53.0	89.2		40.7
Drinks	2.58	79.9	77.5		58.3
Soups and sauces	2.46	34.4	55.8		72.7
Meat and fish	2.23	25.4	40.1		43.1
Candy and snacks	2.20	3.6	30.4		36.0
Unused		178.9	323.0	281.7	265.3
Partly used		223.7	391.4	332.3	290.3
Meal leftover		168.7	263.1	249.1	244.0
Stored leftover		67.3	139.7	179.1	112.8
Proportion unused	.12	.28	.29	.27	.29
Proportion partly used	.28	.35	.35	.32	.32
Proportion meal leftover	.35	.26	.24	.24	.27
Proportion stored leftover	.26	.11	.13	.17	.12

Note: Standard Deviations (SD) provided between brackets.
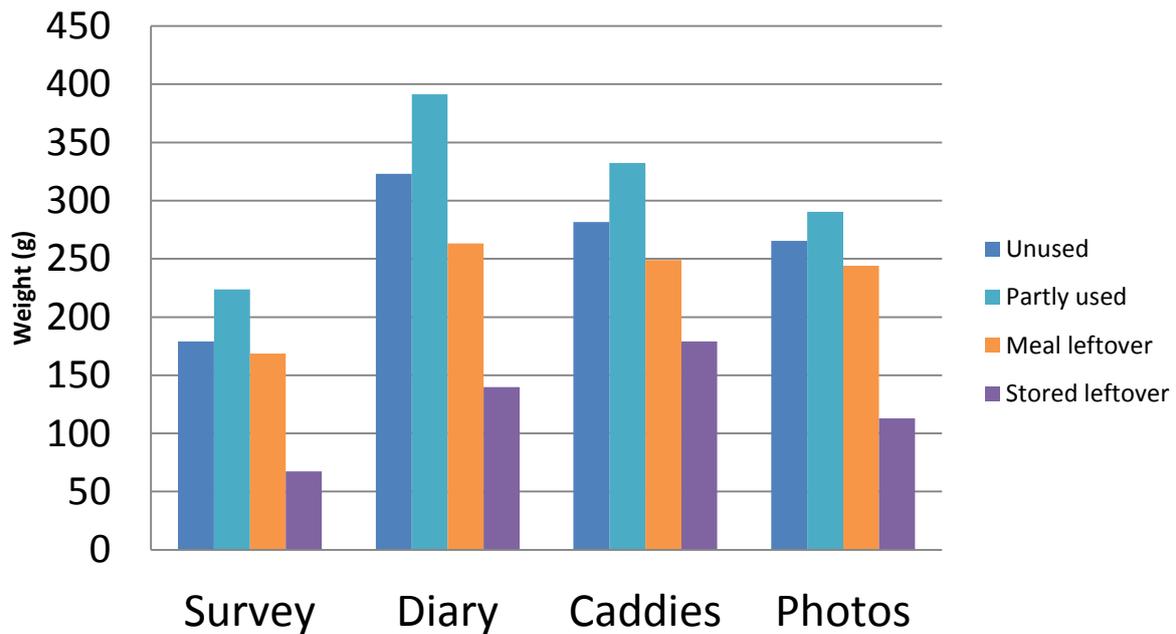
Figure 4. Amount of reported waste in each of the stages

As can be seen in Figure 4, the pattern for the amount of food waste in each stage is similar across the various methods.

8.3.2 Correlations between the weeks

Table 7 provides the correlations between the first and the second week of measurement, for each of the methods. For the survey, we assessed each of the groups in the design separately. As group II did not keep a diary in the first week, we were interested to see if the correlation between the two week-based survey measures would be lower in this group than in the other two groups. If this would have been the case, it would have indicated that keeping the diary influenced the survey measures. A test for differences between independent correlations, based on Fisher's transformation, showed that the difference in correlation between groups I ($r = .59$) and II ($r = .52$) was not significant ($z = 0.47$, $p = .638$). The correlation of group III ($r = .28$) was marginally significantly lower than that of group I ($z = 1.83$, $p = .067$), but not compared to group II ($z = 1.35$, $p = .174$). We thus found no evidence that keeping the diary had influenced the correlation between the survey measures.

Table 7. Correlations between week 1 and week 2

Method	Overall	Unused	Partly used	Meal leftover	Stored leftover
Survey	.46	.23	.41	.61	.27
Survey, group I	.59				
Survey, group II	.52				
Survey, group III	.28				
Diary	.78	.42	.50	.66	.44
Diary, group I	.82				
Diary, group III	.70				
Caddies	.80	.67	.54	.22	.53
Photos	.71	.10	.42	.43	NA[*]

[*] *Note. This state was rarely coded, so the number of observations was very low.*

The relatively low correlation in group III may have been due to low actual correlation between food waste amounts in both weeks, but this seems unlikely given the high correlation for the other methods (photos and caddies were obtained in group III only). Another potential reason for the low correlation for the survey measures in group III is participant fatigue from having to keep track of food waste using all measurements. To check for this, we examined whether reported food waste from the weekly survey was lower in the second week then in the first week, again for each of the three groups of the design, using a paired sample t-test. This was not the case for groups I and III ($t(47) = .82$, $p = .415$ and $t(44) = 0.27$, $p = .789$, respectively).

In group II, where participants did not fill in a diary in the first week, reported food waste in the survey after week 1 was significantly lower (519.5 grams) than after week 2 (758.1 grams) ($t(47) = -2.90$, $p = .006$). Thus not filling out the diary seems to lead to underreporting in the survey.

Overall, correlations between both weeks are average to high (except for the survey in group III). This implies that measurement of food waste in one week (rather than multiple weeks) may suffice as an indication of household food waste.

In addition to the overall correlation, Table 7 also provides the correlations for each of the states. The coding of photos provided difficulty in attribution to states, with especially the state of "meal leftover" being chosen rarely only. As shown in the table, correlations per state are lower than the overall correlations, indicating that the division of waste across the states can differ from one week to the next. This implies that to obtain insight into the states of food waste, measuring across multiple weeks may be more appropriate, when possible.

8.3.3 Correlations between the measurement methods

The correlations indicated in Table 8 were calculated on the basis of weekly weights of food waste. What becomes apparent in the table is that the correlations between the overall waste assessments measures are moderate to high for the various self-reported questions among themselves. Yet, correlations with other waste measurement methods are relatively low, making these appear as relatively less valid measurement methods.

The three methods of caddy, photo, and diary appear to correlate relatively well. The highest correlation is between caddy and diary ($r = .86$). Interestingly, the survey measure in which people are asked to report on their food waste in the past week is also highly correlated to the diary ($r = .71$). As this measure is relatively easy to collect, this type of survey measurement seems promising based on the current study.

Table 8. Correlations between methods

	1	2	3	4	5	6	7
1 Survey: amount (RC)							
2 Survey: proportion	.58 (n=143)						
3 Survey: frequency (RC)	.74 (n=143)	.56 (n=143)					
4 Survey: weighted index	.50 (n=143)	.52 (n=143)	.49 (n=143)				
5 Survey: waste in past week	.40 (n=141)	.27 (n=141)	.44 (n=141)	.48 (n=141)			
6 Diary	.33 (n=94)	.48 (n=94)	.45 (n=94)	.58 (n=94)	.71 (n=231)		
7 Caddy	.34 (n=46)	.25 (n=46)	.26 (n=46)	.45 (n=46)	.51 (n=90)	.86 (n=90)	
8 Photo	.32 (n=45)	.40 (n=45)	.34 (n=45)	.64 (n=45)	.62 (n=86)	.79 (n=88)	.73 (n=87)

Note: RC = reverse coded of the answer categories, such that higher values indicate more waste. All correlations are significant at the $p = .05$ level. Survey measures on overall waste assessment are correlated with the first week measures of other methods.

8.4 Discussion

The measurement methods of survey, diary, photograph coding, and kitchen caddies have been compared. Table 9 provides an overview of the evaluation of the different methods of food waste measurement.

The self-reported measures in the survey include both measures on general food waste (amount, frequency, proportion) and measures on the amount of food wasted in the past week. The measures on general food waste show low levels of reported waste and low variance in reported waste across households, even though all other methods showed evidence of high variance. These measures thus seem less appropriate to measure food waste.

The second set of survey measures relate to the amount of food waste in the past week. In the survey measures, lower levels of food waste are reported compared to diary, caddy, and photo, which is a sign of potential underreporting. Still, the correlation with the diary method was strong, so this appears to be a potentially promising method for large-scale food waste measurement in studies attempting to predict the level of in-home food waste.

For the caddies, a concern was the amount of food waste not disposed of in the caddies (liquids, home composting, feeding to animals). This also relates back to similar voiced concerns about waste compositional analysis. From our study, the impact of these alternative disposal methods appears low. Even though households differed considerable in how much of the food waste is thrown in the caddies, the measurement method correlates strongly with the diary entries. Future research using caddies could devise ways to also measure waste streams not going into the bin (e.g. separate container for liquids), but our results indicate that this additional effort may not be needed.

For the photo coding, despite finding diary entries without photos, we find no evidence of significant systematic underestimation of overestimation compared to the amounts in the diaries. Moreover, the correlation between coded food waste and diary reports is strong, and this thus appears to be a potential alternative measurement of food waste. Because the method is time and effort consuming for the researchers, it seems more suitable for small samples.

Overall, the empirical results from the various methods point towards moderate to strong correlations across the two weeks in the measurement period, at least for the measurement of overall food waste (correlations are less strong when food waste is split into states). At the same time, there is high variance across households. This implies that a week-based measure of food waste is likely able to distinguish these differences between households. When measurement of specific stages is needed, a longer period may need to be considered.

Table 9. Evaluation of the measurement methods

Method	Measure	Description	Amount and variance of measured food waste	Correlation with other measures
Survey	Overall waste assessment	General survey questions	Very low amount (underestimation) Low variance	Low
Survey	Assessment of overall waste per product category	Proportion discarded for each category, in general	No info on amounts Low variance	Low
Survey	Assessment of waste in the past week	Survey on food discarded in the past week	Relatively low amount More variance than other survey measures, but less than diary, caddy, and photo method	Good correlation with diary measure
Diary	Self-reported amount in diary		Highest reported amount High variance	Good correlation with caddy, photo, and week-based survey
Photos	Content-analysis of photos	Weight assessment based on photos	Amount reported in line with diary Medium variance	Good correlation with diary measure
Kitchen caddies	Weighed amount from kitchen caddies		Amount reported in line with diary Medium variance	High correlation with diary method

9   Overall conclusion

Food waste at consumer household level can be measured in multiple ways. Measurement methods include food waste diaries, self-reports on various different scales, in-home observation, waste compositional analysis, self-collection through kitchen caddies, and the coding of photos. All methods have shortcomings, and studies that offer a comparison across methods are lacking. This makes choosing an appropriate method for measuring food waste difficult.

In this report, the abovementioned methods are discussed based on literature, expert interviews, and empirical analysis. Results indicate that general survey questions related to how much a household wastes or how often food is discarded are criticized by experts, have low variance in reported waste across households, and correlate only weakly with other waste measurement methods. For these reasons, such general survey questions do not appear very useful in providing insights into food waste amounts.

This does not imply that all self-reported measures share these limitations. Survey questions that relate to the amount of food wasted in the past week correlate strongly with other methods, but also show underreporting compared to other measures. In the current study, participants were alerted in advance that they would be asked questions on food waste, so that they could anticipate on this measurement and keep track of food waste. Additionally, food waste was assessed per product category and in units appropriate for that category. Although this method results in underreporting of food waste compared to other methods, the strong correlation with these other methods indicates that useful insights into household differences (relative amounts of food waste) can still be obtained. For studies that aim to describe the absolute amount of food waste correctly, the underreporting remains an issue that may be (partly) solved by using a correction factor.

The diary, kitchen caddy, and photograph coding measurement methods correlate strongly, and caddies or photos could thus be used as an alternative to diaries. These methods are more suitable for small samples, given the high level of researcher effort required. The comparison of photograph coding with actual accurate waste amount has confirmed that photo coding can give an accurate indication of food waste.

Food waste varies considerably across days and people. Still, there appears to be high correspondence across the two weeks of measurement for the various measures, when looking at overall food waste levels. This suggests that measurement of food waste for a single week can be enough to provide valuable information on household food waste. Yet, when information on the division across phases is required, it should be taken into account that variations across weeks are more considerable for waste in the different phases.

Concluding, for large-scales measurements, a pre-announced survey about food waste in the past week appears as a viable alternative to diary measurement. For small samples, kitchen caddies and photo coding are also good alternatives. General self-reports on amount, frequency, or proportion of food waste (not related to the past week) are not advisable.

10   References

Abeliotis, K., Lasaridi, K., & Chroni, C. (2014). Attitudes and behaviour of Greek households regarding food waste prevention. Waste Management & Research, 32(3), 237-240.

Adelson, S. F., Delaney, I., Miller, C. & Noble, I. T. (1963). Discard for Edible Food in Households. Journal of home economics, 55, 633-638.

Brook Lyndhurst. (2010). Household Food waste – Cognitive testing of revised behavioural metric questions, unpublished report. Abstract available at: http://www.brooklyndhurst.co.uk/household-food-waste---cognitive-testing-of-revised-behavioural-metric-questions-_154.

Cox, J., Giorgi, S., Sharp, V., Strange, K., Wilson, D. C., & Blakey, N. (2010). Household waste prevention—a review of evidence. Waste Management & Research, 28(3), 193-219.

Dahlén, L., & Lagerkvist, A. (2008). Methods for household waste composition studies. Waste Management, 28(7), 1100-1112.

Dennison, G. J., Dodd, V. A., & Whelan, B. (1996). A socio-economic based survey of household waste characteristics in the city of Dublin, Ireland. I. Waste composition. Resources, Conservation and Recycling, 17(3), 227-244.

Dias dos Santos, L. (2015). Routines, anxiety and guilt in relation to domestic food waste. Unpublished master thesis, Wageningen University.

Farr-Wharton, G., Foth, M., & Choi, J. H. J. (2012). Colour coding the fridge to reduce food waste. In Proceedings of the 24th Australian Computer-Human Interaction Conference (pp. 119-122). ACM.

Farr-Wharton, G., Foth, M., & Choi, J. H. J. (2014). Identifying factors that promote consumer behaviours causing expired domestic food waste. Journal of Consumer Behaviour, 13(6), 393-402.

FUSIONS: Östergren et al., 2014. FUSIONS Definitional Framework for Food Waste. Full report, available at: http://www.eu-fusions.org/phocadownload/Publications/FUSIONS%20Definitional%20Framework%20for%20Food%20Waste%202014.pdf

FUSIONS: Møller et al., 2014. Report on review of (food) waste reporting methodology and practice. Full report, available at http://www.eu-fusions.org/index.php/publications/266-establishing-reliable-data-on-food-waste-and-harmonising-quantification-methods.pdf.

Glanz, R. (2008). Causes of food waste generation in households – an empirical analysis. (MSC Thesis) University of Natural Resources and Applied Life Sciences, Vienna, and Cranfield University).

Graham-Rowe, E., Jessop, D. C., & Sparks, P. (2015). Predicting household food waste reduction using an extended theory of planned behaviour. Resources, Conservation and Recycling, 101, 194-202.

Gray (2009). Down the drain: quantification and exploration of food and drink waste disposed of the sewer by households in the UK, WRAP report, available at: http://www.wrap.org.uk/sites/files/wrap/Down%20the%20drain%20-%20report.pdf.

Gül, A., Isik, H., Bal, T., & Ozer, S. (2003). Bread consumption and waste of households in urban area of Adana province. Electronic Journal of Polish Agricultural Universities, 6(2), 10.

Gutierrez-Barba, B. E. & Ortega-Rubio, A. (2013). Household food waste production and a proposal for its minimization in Mexico. Life Science Journal, 10 (3), 1771-1783.

Hanks, A. S., Wansink, B., & Just, D. R. (2014). Reliability and accuracy of real-time visualization techniques for measuring school cafeteria tray waste: validating the quarter-waste method. Journal of the Academy of Nutrition and Dietetics, 114(3), 470-474.

Høj S.B., 2011. Metrics and measurement methods for the monitoring and evaluation of household food waste prevention interventions, M.Bus thesis, University of South Australia, Adelaide.

IGD (2007). Beyond Packaging: Food waste in the home. Report available at: http://www.fcrn.org.uk/research-library/igd-report-beyond-packaging.

Van Ittersum, K., & Wansink, B. (2012). Plate size and color suggestibility: the Delboeuf Illusion's bias on serving and eating behavior. Journal of Consumer Research, 39(2), 215-228.

Katajajuuri, J. M., Silvennoinen, K., Hartikainen, H., Heikkilä, L., & Reinikainen, A. (2014). Food waste in the Finnish food chain. Journal of Cleaner Production, 73, 322-329.

Koivupuro, H. K., Hartikainen, H., Silvennoinen, K., Katajajuuri, J. M., Heikintalo, N., Reinikainen, A., & Jalkanen, L. (2012). Influence of socio‐demographical, behavioural and attitudinal factors on the amount of avoidable food waste generated in Finnish households. International journal of consumer studies, 36(2), 183-191.

Langley, J., Yoxall, A., Heppell, G., Rodriguez, E. M., Bradbury, S., Lewis, R., ... & Rowson, J. (2010). Food for Thought?—A UK pilot study testing a methodology for compositional domestic food waste analysis. Waste management & research, 28(3), 220-227.

Lebersorger, S., & Schneider, F. (2011). Discussion on the methodology for determining food waste in household waste composition studies. Waste Management, 31(9), 1924-1933.

Martindale, W. (2014). Using consumer surveys to determine food sustainability. British Food Journal, 116(7), 1194-1204.

Raghubir, P., & Greenleaf, E. A. (2006). Ratios in proportion: what should the shape of the package be?. Journal of Marketing, 70(2), 95-107.

Parizeau, K., von Massow, M., & Martin, R. (2015). Household-level dynamics of food waste production and related beliefs, attitudes, and behaviours in Guelph, Ontario. Waste Management, 35, 207-217.

Porpino, G., Parente, J., & Wansink, B. (2015). Food waste paradox: antecedents of food disposal in low income households. International Journal of Consumer Studies, 39(6), 619-629.

Quested, T. Easteal. S., and Ingle, R. (2013). Methods used for household food and drink waste in the UK 2012. WRAP, Annex Report, available at: http://www.wrap.org.uk/sites/files/wrap/Methods%20Annex%20Report%20v2.pdf.

Secondi, L., Principato, L., & Laureti, T. (2015). Household food waste behaviour in EU-27 countries: A multilevel analysis. Food Policy, 56, 25-40.

Sharp, V., Giorgi, S., & Wilson, D. C. (2010). Methods to monitor and evaluate household waste prevention. Waste Management & Research, 28(3), 269-280.

Silvennoinen, K., Katajajuuri, J. M., Hartikainen, H., Heikkilä, L., & Reinikainen, A. (2014). Food waste volume and composition in Finnish households. British Food Journal, 116(6), 1058-1068.

Stancu, V., Haugaard, P., & Lähteenmäki, L. (2016). Determinants of consumer food waste behaviour: Two routes to food waste. Appetite, 96, 7-17.

Stefan, V., Van Herpen, E., Tudoran, A. A., & Lähteenmäki, L. (2013). Avoiding food waste by Romanian consumers: The importance of planning and shopping routines. Food Quality and Preference, 28(1), 375-381.

Ventour, L. (2008). The food we waste (Vol. 237). Banbury/Oxon: WRAP report. Available at: http://www.ifr.ac.uk/waste/Reports/WRAP%20The%20Food%20We%20Waste.pdf

Verghese, K., Lockrey, S., and Williams, H. (2014). Districts, lifestyles and avoiding food waste, Banyule final report. Available at: http://mams.rmit.edu.au/670mkx8wayuiz.pdf

Visschers, V. H., Wickli, N., & Siegrist, M. (2016). Sorting out food waste behaviour: A survey on the motivators and barriers of self-reported amounts of food waste in households. Journal of Environmental Psychology, 45, 66-78.

Wansink, B. (2004). Environmental factors that increase the food intake and consumption volume of unknowing consumers*. Annu. Rev. Nutr., 24, 455-479.

Wansink, B., & Van Ittersum, K. (2003). Bottoms up! The influence of elongation on pouring and consumption volume. Journal of Consumer Research, 30(3), 455-463.

Wenlock, R. W., Buss, D. H., Derry, B. J., & Dixon, E. J. (1980). Household food wastage in Britain. British Journal of Nutrition, 43(01), 53-70.

Williams, H., Wikström, F., Otterbring, T., Löfgren, M., & Gustafsson, A. (2012). Reasons for household food waste with special attention to packaging. Journal of Cleaner Production, 24, 141-148.

WRAP (2011). Reducing household bakery waste. WRAP report, available at: http://www.wrap.org.uk/sites/files/wrap/Research%20Bakery%20Report%20final.pdf.

Annexes

Annex 1 - Details about the measurement methods from literature review

Table: Overview of measurement methods

Nr.	Reference	Source	Sample	Measurement	Appendix
Food waste diary					
P1	Adelson et al. 1963	Discard of edible food in households	Several studies in small groups of households	Inventory of food available in the home for 7 product categories and their weights taken at beginning and end of a 7-day period. Record was kept during intervening days of the weights of additional food brought into the household as well as any foods discarded.	No details in paper
P2	Williams et al. 2012	http://brage.bibsys.no/xmlui/bitstream/handle/11250/93524/Gustafsson_JCP_2012.pdf?sequence=1&isAllowed=y	61 households	Families measured amount of food waste during 7 days (mostly weight, but sometimes approximate amounts) and noted in a diary why each item was wasted.	Yes
P3	Langley et al., 2009	doi:10.1177/0734242X08095348	13 households	Diary for seven consecutive days. List of food categories, waste routes, and lifecycle stages. Also noted are packaging type, origin, weight, % consumed, visible dates, cost.	Yes
P4	Katajajuuri et al., 2014	doi:10.1016/j.jclepro.2013.12.057	380 participants, Finland	Participants were equipped with electronic kitchen scales, a diary, and detailed instructions on how to weigh and record their waste and associated reasons for waste; over two week period.	Yes
P5	Koivupuro et al., 2012	doi: 10.1111/j.1470-6431.2011.01080.x	380 participants, Finland	Methods described in more detail in Silvennoinen et al.	Method not described in this paper
P6	Silvennoinen et al., 2014	http://dx.doi.org/10.1108/BFJ-12-2012-0311	380 participants, Finland	Diary, written entries, during 2 week period	Yes, probably same study as P4 and P5
G4	Quested et al., 2013	Household food and drink waste in the UK with Annex	Kitchen diary: 1192 households	Various measures, including kitchen diary	Yes
G14	Gray, 2009	Down the drain.	319 individuals in UK households	Diary (7 days, self-completion on paper, backed up by telephone support): recorded food waste, including the type, amount (weight or volume), and reason for disposal.	Yes
G16	WRAP, 2011	Reducing household bakery waste	Pilot: 8 consumers, second round: 48 consumers.	Short diary in pilot. Two week diary in second round.	Yes
G19	Ventour, 2008	The food we waste v2	Diary: 284 completed diaries returned	Food waste diary and waste compositional analysis. Weight and cost of wasted food by UK household in total, by type of food, by state of preparation, foods whole or unopened, foods still in date.	Yes
G12	IGD, 2007	Beyond Packaging: Food waste in the home	Survey (n = 1,036) and 8 interviews based on diary during 1	Survey with UK shoppers (no measure on amount). Interviews: see appendix. Guided discussions + diary and observation of food stocks.	Yes

				week.	
	Verghese et al., 2014	Report for Banyule city council	23 households, Australia	Diary on what is cooked and what is not eaten, combined with photographs of stored food that has 'gone off'	Details on diary not available

Self-report, proportional measure to what is brought into the household

P7	Stefan et al. 2013	doi:10.1016/j.foodqual.2012.11.001	244 consumers, online recruitment, Romania	Amount thrown away as proportion of what is bought in a regular week, in general and for 5 product categories	Yes
P8	Dias dos Santos, 2015	Available upon request from MCB group (MSc thesis)	368 consumers, Netherlands	For 4 product categories, questions on 100-point sliders for how much they think they waste from the products bought every week, ranging from very little to very much. For prepared and unprepared separately.	Yes
P9	Abeliotis et al., 2014	doi:10.1177/0734242X14521681	231 participants, recruited in shopping areas, Greece	Self-reported food waste. Question "How much of the total food items do you throw away into the bin?", answer categories: significant amounts, quite a bit, small amount, hardly any, none	No
P10	Stancu et al., 2016	doi:10.1016/j.appet.2015.08.025	1062 Danish respondents	Web-based survey. Items worded as "how much … is thrown away in your household of what you buy and/or grown, in a regular week", for food, milk and dairy products, fresh fruits and vegetables, meat and fish, bread and other bakery products. Scale: hardly any, less than a tenth (less than 10%), more than a tenth but less than a quarter (between 10% and 25%), more than a quarter but less than a half (between 25% and 50%), more than a half (more than 50%).	No
P11	Secondi et al., 2015	doi:10.1016/j.foodpol.2015.07.007	Over 26,000 individuals	Percentage of food that each individual buys which goes to waste, by distinguishing six categories ranging from "none" to "more than 50%". Flash Eurobarometer survey.	No
P22	Graham-Rowe et al., 2015	doi:10.1016/j.resconrec.2015.05.020	204 individuals	Self-reported waste in fruit and vegetables, both baseline and follow-up. Question: "Please estimate what percentage of your household's total fruit/vegetables got thrown away in the last seven days." Possible responses ranged from 0% (1) to 100% (11) with ten percent increments.	No

Self-report, non-proportional scale

P12	Parizeau et al., 2015	doi:10.1016/j.wasman.2014.09.019	61 households; door-to-door survey added to weighting of garbage placed at the	Observations and questionnaire. Participants reported the frequency of food wastes for trim, spoiled food, food we didn't like, food at best before date, overprepared food, on an answer scale with regularly, sometimes, infrequently, never.	No

			curb.		
P13	Gül et al. 2003	http://www.ejpau.media.pl/articles/volume6/issue2/food/art-10.pdf	391 households, Adana province	Households are asked their approach to bread waste. Response categories: definitely wasting, wasting, medium, no wasting, definitely no wasting.	No
G16	WRAP, 2011	Reducing household bakery waste	492 UK respondents. door-to-door survey.	Claimed bread waste, in slices in a typical week, on a scale with no waste, 1-2 slices, 3-4 slices, 5-9 slices, 10-14 slices, 15+ slices. Number of items typically thrown out for rolls, pittas, wraps, crumpets, and croissants.	No
P24	Visschers et al., 2016	doi:10.1016/j.jenvp.2015.11.007	N = 796, Swiss-German, pen-and-paper questionnaire	For 11 food groups, the frequency of disposal and the amount disposed were indicated. Amount indicated in portions, where one portion was defined as one handful.	Yes

Self-report, with photographs to report actual waste (photos taken of waste itself)

P14	Farr-Wharton et al. 2012	http://eprints.qut.edu.au/54184/4/54184.pdf	7 households	Interview and photographs. Participants were encouraged to either take a photograph or write down a list of expired products that were thrown away each week.	No
P15	Farr-Wharton et al., 2014	doi: 10.1002/cb.1488	12 participants and 6 households	In-depth interviews, in-home observation and photographs of inside of fridges, examining content of bins, weekly visits over a 4-week period	No
P16	Porpino et al., 2015	doi: 10.1111/ijcs.12207	14 households, lower-middle income, Brazil	Interviews, in situ observations, and photographs, focus group	No

Self-report with photographs/images to estimate waste amount (photos as a prompt, participants do not make photos themselves)

P17	Martindale, 2014	http://dx.doi.org/10.1108/BFJ-09-2013-0242	83 households	Quantities of food waste by indicating how much of a meal is wasted, using oval shapes.	Yes
G21	Brook Lyndhurst, 2010	Household food waste – cognitive testing of revised behavioural metric questions	20 participants, 4 locations in UK	Testing of survey questions. Open question on how much food is wasted; photographs shown of various amounts of waste for apples, bread, mixed food; used to estimate amount of waste	No

Observation: Expired products in the households

G1	Glanz, 2008	Causes of food waste generation in households (Msc Thesis)	21 households, Vienna & Lower Austria	Face-to-face interviews. Expired products in storage, both in number as in net mass, both unopened and opened, partially used food.	No

Waste compositional analysis

P23	Dennison et al., 1996	doi:10.1016/0921-3449(96)01070-1	867 Dublin households	Waste collected and hand-sorted into 12 main categories and 36 categories in total. Waste fractions were weighed. Over a 5-week period.	No

G4	Quested et al., 2013	[Household food and drink waste in the UK](#) with [Annex](#)	1800 UK Households.	Various measures, including waste compositional analysis.	No
G19	Ventour, 2008	[The food we waste v2](#)	Waste collection: 2138 households	Food waste diary and waste compositional analysis. Weight and cost of wasted food by UK household in total, by type of food, by state of preparation, foods whole or unopened, foods still in date.	No
	Parizeau et al., 2015	[doi:10.1016/j.wasman.2014.09.019](#)	222 households; 61 also filled in a survey	Waste compositional analysis.	No
Self-collection of in-home waste					
P18	Wenlock et al. 1980	[10.1079/BJN19800064](#)	672 households	Households collected all food wasted in their homes during 1 week	Yes
P19	Gutierrez-Barba & Ortega-Rubio, 2013	[Household food-waste production](#)	41 families	Households turned in a day's waste to collectors, weekly, for a full year. Weighing of waste.	No

Annex 2 - Invitation email practitioner input

Dear [name potential informant]

I contact you on behalf of the EU project REFRESH (="Resource Efficient Food and dRink for the Entire Supply cHain"). REFRESH aims at taking action against food waste. 26 Partners from 12 European countries and China work towards the project's goal to contribute towards the objectives of reducing food waste across Europe. More detailed information can be found here: http://eu-refresh.org/. As part of the total project, we are investigating consumer in-home food waste. As a first step, we are cataloguing the currently available methods on how to measure consumer in-home food waste.

We understood from the recommendation of [name] that you have relevant hands-on experience with at least one of the currently available methods and therefore we are now reaching out to you for an exchange on this topic with regard to your personal experiences.

In exchange for your participation, you will receive a summary of the evaluations of all other contacted experts in February 2016.

How to proceed from here?:

- STEP 1: Please reply directly to this mail and indicate whether or not you are willing to participate
- STEP 2: Once you have indicated your willingness to participate, you will receive our questions by email and we will make an appointment for a telephone call with you (first and second week of January 2016).
- STEP 3: In preparation of this call, please read the questions, and type in your responses to the open-ended questions in the word document. If possible, please send the answers back to me so I can read them in preparation of our interview.
- STEP 4: We will call you to discuss your insights in more detail with you.

To set up the telephone calls, can you please provide us with your telephone number and good times to be contacted, preferably in the week of January 4th. Attached to this email you will find the available times. Thank you in advance for your valuable input, it is highly appreciated!

On behalf of the WP1 team, yours sincerely,

Annex 3 - Survey for the practitioners' input

Measuring at-home food waste at the household level

At-home food waste at the household level can be measured in many different ways. We are interested in your opinion on the advantages and disadvantages of these methods. If you are less experienced with one or more of the methods, you can indicate so. We would still be interested in hearing your opinions of these method(s), even if you have not used it yourself, but if you feel you cannot comment on a specific method you can of course leave it blank.

Each of the methods is indicated on a separate page.

The methods are

1. food waste diary
2. survey
3. in-home observation
4. waste compositional analysis
5. kitchen caddies

On the last page, there are additional general questions.

Thank you very much for your participation, it is highly appreciated!

Food waste diary

Explanation: Participants are asked to report the amount of food that they waste over a period of several days. The diaries typically include the type, amount, and reason for disposal of food products. Sometimes weighing scales are provided, so that participants can record the weight of food wasted; other diary-based studies have asked participants to describe the amount of waste (e.g. 2 slices of toast, 3 apples, a handful of grated cheese). Existing diary studies typically use pen and paper diaries, although there are also versions that can be filled on a computer or smart phone / tablet.

1. To which extent do you have experience with this method?

2. Do you think this method provides an accurate estimate of the amount of food waste that occurs in a household? Why or why not?

3. Do you think this method can provide information at a detailed level (e.g., differentiating waste relating to prepared and unprepared food)?

4. In your opinion, does this method require a lot of effort by participants? Why / why not?

5. In your opinion, does this method require a lot of effort by the researcher? Why / why not?

6. What other main advantages or points for concern can you mention for this method?

7. Food waste can be recorded in different ways (amount of grams, approximations such as number of cups, approximations using pictures of example amounts, etc.). Which would you feel is most useful?

8. Record keeping in the diaries could be supported by ICT (filling out the diary online, push messages as reminders, etc.). Do you feel this would be useful? Why?

Survey

Explanation: Participants are asked at one point in time to answer questions on their level of food waste. This could be done on paper, online, or in an in-depth interview. Different types of questions have been used in the past, using the amount of waste relative to the total food coming into the household (e.g., what percentage of food items bought is wasted), the frequency with which food is wasted (e.g., regularly to never), categories on how much is wasted (e.g., very little to a lot), or visual scales (e.g. with pictures of different amounts where people can indicate which best resembles their own food waste).

1. To which extent do you have experience with this method?

2. Do you think this method provides an accurate estimate of the amount of food waste that occurs in a household? Why or why not?

3. Do you think this method can provide information at a detailed level (e.g., differentiating waste relating to prepared and unprepared food)?

4. In your opinion, does this method require a lot of effort by participants? Why / why not?

5. In your opinion, does this method require a lot of effort by the researcher? Why / why not?

6. What other main advantages or points for concern can you mention for this method?

7. Food waste can be measured in different ways. On the next page, several possibilities are indicated. Which would you feel is most useful? Why? If you have any specific comments on the question wording suggested, please suggest changes here or in the questions.

Question examples

A. Relative proportion of food that is wasted

How much would you say that you throw away, of what you buy and/or grow, in a regular week?
'nothing' – 'less than a tenth' – 'more than a tenth but less than a quarter' – 'more than a quarter but less than a half' – 'more than a half'

How much of the total food items do you throw away into the bin?
'significant amounts' – 'quite a bit' – 'small amount' – 'hardly any' – 'none'

B. Frequency-based measure

Indicating the amount of food waste on the following answer scale:
'regularly' – 'sometimes' – 'infrequently' – 'never'

C. Estimate of amount of food waste

Indicating how much wasting is going on, on the following answer scale:
'definitely wasting' – 'wasting' – 'medium' – 'no wasting' – 'definitely no wasting'

D. Photographs to indicate amount of food waste

Using photographs of various amounts of waste for specific food categories – participants indicate which photo best depicts the amount.

E. Visual scales to indicate amount of food waste

Using oval shapes to approximate how much food was thrown away. Participants tick the shape that corresponds to how much of a meal is wasted. If no shapes correspond to how much was wasted, they state the number or fraction of a shape that best approximates the amount of waste. Graphic below has been reduced in scale.
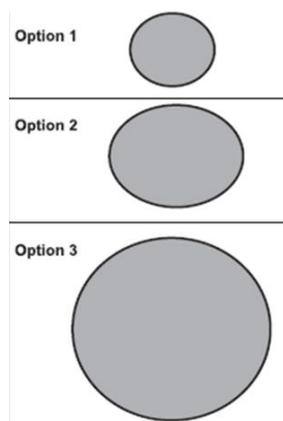
At-home observations

Description: In this method, observations are made in the home of participants in order to assess their household food waste. Observations can be made in person or using high-tech devises. The latter include video-recordings, trashcan cameras and automatic electronic weighing of waste in the trashcan.

1. To which extent do you have experience with this method?

2. Do you think this method provides an accurate estimate of the amount of food waste that occurs in a household? Why or why not?

3. Do you think this method can provide information at a detailed level (e.g., differentiating waste relating to prepared and unprepared food)?

4. In your opinion, does this method require a lot of effort by participants? Why / why not?

5. In your opinion, does this method require a lot of effort by the researcher? Why / why not?

6. What other main advantages or points for concern can you mention for this method?

7. At-home observations can be based on visits to households and/or on use of high-tech equipment. Which would you feel is most useful? Why?

Waste compositional analysis

Description: In this method, food waste of individual households is collected, and physically separated, weighed and categorized. It has also been referred to as "waste characterization" or "waste type". This method can be applied to kerbside collection (to find food waste in the 'solid' waste streams including residual (general), separate food and mixed food and garden).

1. To which extent do you have experience with this method?

2. Do you think this method provides an accurate estimate of the amount of food waste that occurs in a household? Why or why not?

3. Do you think this method can provide information at a detailed level (e.g., differentiating waste relating to prepared and unprepared food)?

4. In your opinion, does this method require a lot of effort by participants? Why / why not?

5. In your opinion, does this method require a lot of effort by the researcher? Why / why not?

6. What other main advantages or points for concern can you mention for this method?

Kitchen caddies

Description: In this method, participating households are asked to collect the food waste they generate into a designated container (e.g., a caddie, a box). This container is then weighed at regular intervals (e.g., daily, weekly) and the weight recorded on a form (using pen and paper or on a smart phone / tablet). It is possible to provide participants with multiple caddies for collecting different types of food waste.

1. To which extent do you have experience with this method?

2. Do you think this method provides an accurate estimate of the amount of food waste that occurs in a household? Why or why not?

3. Do you think this method can provide information at a detailed level (e.g., differentiating waste relating to prepared and unprepared food)?

4. In your opinion, does this method require a lot of effort by participants? Why / why not?

5. In your opinion, does this method require a lot of effort by the researcher? Why / why not?

6. What other main advantages or points for concern can you mention for this method?

7. Participants could be asked to separate different types of food waste (e.g., unprepared foods, prepared foods) in different caddies. Do you think this would be useful to obtain more insights? Why?

General questions

We also would like your input on a few general questions:

1. Do you have any general points that you would like to highlight? For instance, issues that are applicable to a large number of methods?

2. Did you miss any methods in the list above? If so, what did you miss?

3. Which measurement method would you prefer to use if you were to set up a large-scale quantitative study on food waste? (e.g., around 1000 participants)

4. Would you prefer a different measurement method for a smaller-scaled study? (e.g., around 30 participants)

5. Are you aware of any references that would be useful in the context of evaluating methods (e.g., studies comparing methods of food waste measurement in the home)?

Thank you!

Annex 4 - Second email practitioner input

Dear name expert,

In January you have you participated in an expert interview about food waste.

We would like to thank you again for your contribution. With your help we have collected a lot of information and we now have deeper insights in the different methods, which will be very helpful in the Refresh project.

In total we completed 13 interviews with experts from different countries and expertise. From these interviews we prepared a summary. For each method we have made a summary with advantages, disadvantages and neutral remarks. Furthermore we made a general conclusion per method.

We hope that we have added all the relevant information. Feel free to give your feedback if you miss anything you've said or if you have any additions. In particular, we would be very interested to hear about any points made by other experts to which you may disagree or which spark further ideas.

Please note that the summary that we provide reflects the views expressed by the interviews only, which may differ from the view of the REFRESH project. Later this year, there will be a public report on these interviews combined with a literature study. In this report we want to add a table with the list of the interviewed experts. Please let us know if we have permission to mention your name.

Please send us your feedback and your potential permission to mention your name before February 26th.

Best regards,

..... on behalf of the Refresh project team.

If you're interested in the Refresh project, you can visit the Refresh website with the following link: http://eu-refresh.org/

Annex 5 - Main advantages and disadvantages according to practitioners' input

Method	Advantage	Disadvantage	Neutral
In Home Observation	*Explanation*: In this method, observations are made in the home of participants in order to assess their household food waste. Observations can be made in person or using high-tech devises. The latter include video-recordings, trashcan cameras and automatic electronic weighing of waste in the trashcan.		
Summary	In general the in-home observation method can be used to give insight in the real behaviour of consumers. Because the researchers are present they are able to ask in depth questions. Also some researchers think this method can be used to quantify food waste accurate others think this method is better for understanding. They all agree that this is a time consuming and expensive method (not for large groups). Also the privacy of the participants can be an issue.		
Common-remarks	● *Real behaviour* ● *Possible to identify drivers of food waste by in depth questions* ● *As detailed as you would like* ● *Accurate method* 　*-while the researches measures the food waste in a standardized way* 　*-because it eliminates necessity to estimate* 　*-evidence based* 　*-if the quality and quantity can be identified* ● *Not much effort needed for the participant* ● *Participants need not to be trained*	● *Not for quantifying data* ● *Participants can be influenced by the attendance of the researcher* ● *Privacy of participants:* 　*-intrusive (stranger in household)* 　*-use of cameras* ● *Time consuming* 　*-physically observation by researcher cannot be done all day long* 　*-using multiple cameras takes a lot of time to encode* ● *Effort needed from researchers* 　*-need a training in standardizing the food waste measurement* 　*-need a training in coding and analysing videos* 　*-need a training in ethnographic oriented methods* 　*-need to be on-site* ● *Pricey to buy and install all technical equipment* ● *Hard to recruit participants* ● *Small groups because of costs*	● *Combining house visits and cameras* 　*-cameras for quantification (e.g. leftovers, fridge checked for expired foods)* 　*-dialogues among family members can explain food related decisions* 　*-use of cameras leads to less effort for the researcher and more privacy perceived by participants (=> less biased data, more natural behaviour)*

Method	Advantage	Disadvantage	Neutral
Diary	*Explanation*: Participants are asked to report the amount of food that they waste over a period of several days. The diaries typically include the type, amount, and reason for disposal of food products. Sometimes weighing scales are provided, so that participants can record the weight of food wasted; other diary-based studies have asked participants to describe the amount of waste. Existing diary studies typically use pen and paper diaries, although there are also versions that can be filled on a computer or smart phone / tablet		
Summary	In general the diary method can be used to quantify food waste in a relatively easy way. However this method also has its limitation (awareness increases while measuring food waste also underestimation/underreporting can occur). Another limitation is the fact that in general no insight is gained about why food is wasted, unless this is asked. It needs more effort from the participants compared to other methods especially when detailed information is asked.		
Common-remarks	● *It gives a pretty accurate estimate however underestimation can occur* ● *Detailed information about type of food* ● *Other relevant information* 　*-state of preparation* 　*-disposal paths* 　*-reasons for food waste (if asked)* ● *Cheap and easy for large scale experiments (for researchers)*	● *Due to the research itself, food waste awareness increases* ● *Underestimation/ Underreporting* 　*-forgetting, don't want to report* 　*-depends on the involvement and engagement of the respondents (and their family)* 　*-liquid food not always recorded* 　*-social desirable underreporting* 　*-fatigue* ● *Participants have to be trained (unclear about food waste descriptions as well)*	● *Outcomes preferred* 　*-grams/volumes* ● *Effort needed from researchers* 　*-compromise between keeping it simple/getting it accurate* 　*-precise definition of wasted food needed* 　*-design questionnaire/diary* 　*-training the participants* 　*-supervise follow up (motivate, encourage)* 　*-data collection/analyses* ● *Effort needed from participants depends on the duration* ● *High tech/ICT very useful for making pictures, reminders and motivation of participants*

Method	Advantage	Disadvantage	Neutral
Waste composition analysis	*Explanation*: In this method, food waste of individual households is collected, and physically separated, weighed and categorized. It has also been referred to as "waste characterization" or "waste sort". This method can be applied to curb side collection (to find food waste in the 'solid' waste streams including residual (general), separate food and mixed food and garden).		
Summary	In general the waste composition analysis can be used to quantify the food waste of consumers in an accurate way. However it gives less information at detailed level because it can be hard to separate the waste. Furthermore is time consuming, expensive method and risky to health and unpleasant for the researchers.		

Common-remarks	● *Real behaviour*
	● *Less bias*
	● *Measurement of waste can be performed correctly*
	● *Gives an accurate estimate of food waste*
	● *No effort for participants*
		● *Underestimation/Underreporting*
		  -no liquids
		  -food waste composted
		  -food waste fed to animals
		● *Less information at detailed level than measured when it is thrown away*
		  -hard to separate waste
		  -not possible to distinguish state of preparation
		● *No insight in WHY respondents waste food*
		● *Effort needed from researchers*
		  -potentially risky to health and safety, unpleasant, reluctant and dirty
		  - time consuming: gathering, sorting, weighting and analysing
		  -Logistics: collecting, coordination and management
		  -need a training in standardizing the food waste measurement
		● *Expensive method*
		● *Difficult to get a representative sample size*
			● *Information detail depends on the collection method*

Method	Advantage	Disadvantage	Neutral
Survey	*Explanation*: Participants are asked at one point in time to answer questions on their level of food waste. This could be done on paper, online, or in an in-depth interview. Different types of questions have been used in the past, using the amount of waste relative to the total food coming into the household (e.g., what percentage of food items bought is wasted), the frequency with which food is wasted (e.g., regularly to never), categories on how much is wasted (e.g., very little to a lot), or visual scales (e.g. with pictures of different amounts where people can indicate which best resembles their own food waste).		
Summary	In general the survey method can be used to give insight in WHY respondents waste food (motives). However it not a reliable method to quantify food waste.		

Common-remarks	● *Good method to give insight in WHY respondents waste food (motives)*
	● *Can be combined with other methods (e.g. diary, observation, interviews)*
	● *Not much effort needed for the participant (easiest method)*
	● *Cheap, easy and fast for large scale experiments (for researchers)*
		● *Not for quantifying data*
		● *Underestimation/Underreporting*
		  -don't want to report
		  -good capacity for remembering needed
		  -difficult to assess the amount of food waste
		  -don't know
		● *Low reliability*
		● *No accurate estimate*
		● *Difficult to recruit a representative population (especially interested people in food waste will participate)*
			● *If nevertheless the survey is used to quantify food waste the most recommended methods are:*
			  -relative proportion of food
			  -frequency based measure
			● *Effort needed from researchers*
			  -formulate questions in a clear and unambiguous way
			  -pretesting questionnaire for feasibility
			  -knowing which answer categories are needed

Method	Advantage	Disadvantage	Neutral
Kitchen caddies	*Explanation*: In this method, participating households are asked to collect the food waste they generate into a designated container (e.g., a caddie, a box). This container is then weighed at regular intervals (e.g., daily, weekly) and the weight recorded on a form (using pen and paper or on a smart phone / tablet). It is possible to provide participants with multiple caddies for collecting different types of food waste.		
Summary	In general the kitchen caddies method can be used to quantify the food waste of consumers in an accurate way. It can also give information at detailed level if multiple bins are used and the participants follow the instructions precisely. However this method needs a lot of effort from the researchers especially in the logistics. There was no/less experience by the interviewed researchers so most of the remarks are based on thoughts.		
Common-remarks	• *It could give an accurate estimate of total amount of food waste* • *If more bins are used it gives information about the different stages of waste* • *Easier for participants than diary*	• *Due to the research itself, food waste awareness increases* •*Effort for participants* 　-sorting 　-if several bins are used it could be difficult for participants to sort it in the right way 　-detailed instructions are necessary • *Logistics are challenging* • *Difficult to store the bins (space and mould)* • *Time consuming* • *No insight in WHY respondents waste food*	• *The detailed level depends on the amount of bins and how properly the participants are using the bins* • *Different opinions about the effort needed from participants* 　-no effort, less effort, easier than food waste diaries 　-quite challenging to do precisely • *Effort needed from researchers* 　-precise definition of wasted food needed (especially with more bins) 　-collecting and bringing bins (logistics) 　-weighting is smelly 　-motivation of participants

Annex 6 - Instructions for participants (group III)

Instructies groep 3b

In dit onderzoek zijn we geïnteresseerd in wat in uw huishouden aan voedsel gekocht wordt, maar uiteindelijk toch niet wordt opgegeten.

We willen inzicht krijgen in wat er weggegooid wordt. Probeer dus uw gedrag niet aan te passen door zo min mogelijk weg te gooien maar doe zoals u anders ook zou doen. Alle gegevens worden anoniem opgeslagen.

Het is de bedoeling dat u gedurende twee weken uw voedselafval gaat fotograferen, wegen, en in de door ons geleverde afvalbakken gooit. Voor de studie is het voedsel dat u niet hebt opgegeten ingedeeld in fases en categorieën. Hierover later meer. In de instructies staat per stap vermeld wat er van u verwacht wordt.

Wat gaat u in het kort doen?

Wij vragen u om bij te houden wat er in uw huishouden aan voedsel wordt weggegooid. Al het voedsel dat bedoeld is om op te eten en niet meer gegeten wordt, valt hieronder. Het maakt niet uit of u het voedsel weggooit in de afvalbak, GFT-bak, op de composthoop of aan (huis)dieren geeft. Het is de bedoeling dat alles wat niet meer wordt opgegeten door mensen, bijgehouden wordt.

U gaat de volgende stappen doorlopen:

1. Foto maken van de resten en deze mailen naar ADC.studie@wur.nl o.v.v. van uw huishoudnummer
2a. Wegen van de resten en de gewichten invullen in het dagboekje
2b. Fase & categorie noteren
3. Resten weggooien in door ons geleverde afvalbakken

Let op! Het gaat hierbij alleen om voedselresten die eetbaar zijn of eetbaar waren. Botten, schillen, pitten, stronken b.v. gooit u in uw eigen afvalbak. Die zijn niet eetbaar, en tellen daarom niet mee. Maar producten die u weggooit omdat ze bedorven of over de datum zijn, moet u wel bijhouden.

Ook gaat het alleen om eten dat thuis wordt weggegooid. Dus niet als u bijv. uit eten gaat of uw lunch buitenshuis nuttigt. Het werkt op de volgende manier. Iedere keer als u voedsel weggooit, maakt u een foto, weegt u dit en vult u dit gewicht in en ook de nummer van de fase en categorie. Vervolgens gooit u het in het juiste compartiment van de afvalbak. Voor uitleg van de fases en categorieën zie de volgende pagina en het bijgeleverde losse A4-tje. Het is belangrijk dat u ook uw huisgenoten attent maakt op de studie zodat ook deze maaltijdresten genoteerd worden.

Lees vooraf ook even de veel gestelde vragen en de voorbeelden door. Hopelijk zijn dan veel van uw vragen beantwoord.

Gedurende de studie komen wij op een vast aantal momenten het afval bij u ophalen. Verderop in deze instructies kunt u zien op welke dagen we het afval komen ophalen. Hiervoor hoeft u niet thuis te zijn, maar u kunt de zak op de afgesproken plek neerzetten.

Aan het einde van de studie komen we de afvalbakken weer bij u ophalen en kunt u alle ingevulde formulieren aan ons meegeven. U heeft u al een mail ontvangen met het tijdstip waarop we bij u komen.

Mocht u nog vragen hebben neem dan gerust contact met ons op via: ADC.studie@wur.nl.

Wat zit er in dit pakket?

- Instructies
- Invullijsten voorzien van uw huishoudnummer
- Placemat
- Los A4-tje met overzicht van fases en categorieën
- Twee afvalbakken met ieder twee compartimenten
- Per categorie 7 kleine afvalzakken voorzien van stickers (6+1 reserve)
- 6 grote vuilniszakken voorzien van sticker met uw huishoudnummer

Ook de korstjes in de ADC-bak

Botten in eigen afvalbak

Schillen in eigen afvalbak, de niet gegeten aardappelen in ADC-bak

Hieronder kunt u zien welke fases en categorieën er zijn:

Uitleg fases:

1) **Geheel ongebruikt voedsel:** Voedsel dat nog helemaal niet is gebruikt (b.v. ongeopende verpakkingen, beschimmelde appel, uitgedroogde prei)

2) **Deels gebruikt voedsel:** Voedsel dat weggegooid wordt als het deels gebruikt is (b.v. broodkapjes, halve verpakking vleeswaren, een ½ ui of courgette die niet gebruikt wordt om het gerecht te bereiden)

3) **Maaltijdresten:** Maaltijdresten die op het bord of in de pan blijven liggen na het eten (b.v. restjes aardappel, rijst, stamppot etc. of brood dat in de lunchtrommel terug naar huis komt)

4) **Restjes na bewaring:** Restjes / kliekjes die weggegooid worden nadat ze bewaard zijn geweest (b.v. kliekjes die u na het eten in de koelkast heeft bewaard maar vervolgens toch niet opeet)

Uitleg voedingscategorieën:

1) **Groente** (vers / pot / blik / diepvries)
2) **Fruit** (vers / pot / blik / gedroogd / diepvries)
3) **Aardappel en aardappelproducten** (frietjes, voorgekookte krieltjes, etc)
4) **Pasta en rijst** (inclusief wraps, couscous, etc)
5) **Vlees, vleesvervangers, en vis**
6) **Brood, broodbeleg** (vleeswaren, zoet beleg, pakjes kaas, etc) **en ontbijtgranen** (muesli, cruesli, brinta, etc)
7) **Zuivelproducten** (yoghurt, vla, etc) **kaas, en eieren**
8) **Soepen en sauzen** (ketchup, mayonnaise, cocktailsaus, etc.)
9) **Snoep** (snoepjes, chocolade repen, etc.), **koekjes, tussendoortjes, chips en nootjes**
10) **Dranken** (melk, sappen, frisdrank, alcoholische dranken; hier valt NIET onder water/thee/koffie/siroop)

Voorbeeld 2
U kocht vorige week een avocado die te zacht is geworden om nog te gebruiken. Leg de avocado recht in het midden van de placemat voor de foto.

Voorbeeld 3
U gebruikt de komkommer niet helemaal en wilt deze weggooien. Leg de komkommer recht in het midden van de placemat voor de foto.
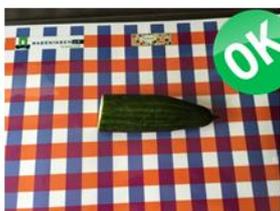
Stap 1: Hoe gaat het maken van foto's in zijn werk?

Als u een foto maakt van de producten die u weggooit, is het belangrijk dat u het op de door ons geleverde placemat legt. Om deze manier krijgen wij een goed beeld van de verhoudingen en kunnen wij inschatten hoeveel het is.

De foto's kunt u mailen naar ADC.studie@wur.nl. Vermeld hierbij in het onderwerp uw huishoudnummer.

Hieronder ziet u enkele voorbeelden zodat duidelijk wordt hoe u het beste kunt fotograferen

Voorbeeld 1
U neemt een glaasje melk bij het ontbijt. U drinkt het echter niet op en gooit de melk weg. Maak een foto van het glas melk met duidelijk daarachter de placemat. Gebruik hiervoor een recht glas.

Voorbeeld 4
U heeft een onaangebroken verpakking kipfilet die helaas over de datum is. Fotografeer de hele verpakking zodat het gewicht op de verpakking zichtbaar is. De placemat hoeft er niet bij.

Voorbeeld 5
U heeft een aangebroken verpakking veldsla en peterselie die u verder niet meer gebruikt. Leg één voor één de verpakking recht in het midden van de placemat. Fotografeer de hele verpakking zodat het gewicht op de verpakking en de resterende inhoud zichtbaar is.

Voorbeeld 6
U heeft een aangebroken verpakking kwark die u verder niet meer gebruikt. Zet de verpakking in het midden van de placemat. Fotografeer de hele verpakking zodat het gewicht op de verpakking en de resterende inhoud zichtbaar is.

Voorbeeld 7
U heeft een klein restje zilveruitjes in de koelkast staan dat u verder niet meer gebruikt. Zet het potje in het midden van de placemat. Maak in dit geval twee foto's, zodat het gewicht op het potje en de resterende inhoud zichtbaar is.

Voorbeeld 8
Heeft u (dagelijks) broodkorstjes over, dan willen we daar ook graag dagelijks een foto van.

Voorbeeld 9
U kon niet de hele maaltijd op en u gaat dit niet bewaren voor de volgende dag. U fotografeert de maaltijdresten op het bord op de placemat.

Voorbeeld 10

U heeft een restje gekookte spaghetti bewaard van een eerdere maaltijd . U gaat dat toch niet meer gebruiken. U fotografeert het restje bij voorkeur in een transparant bakje. Zet het bakje daarvoor recht op de placemat zodat de inhoud goed zichtbaar is.

Als u de foto gemaakt heeft dan weegt u vervolgens de resten. Hoe dit in zijn werk gaat staat uitgelegd onder het kopje dagboekjes.

Hoe kunt u een foto versturen met een android telefoon?

STAP 1	STAP 2
Selecteer de foto die u wilt versturen. En tik erop om deze te openen op uw telefoon	Tik op het omcirkelde pictogram

STAP 3	STAP 4
Tik nu op het e-mail pictogram om het e-mail programma te openen	Klik op het veld "aan" en vul het e-mailadres: ADC.studie@wur.nl in. Vul bij het onderwerp uw huishoudnummer in. Dit nummer staat op de sticker achter uw naam en op de sticker op het dagboekje. U kunt nu de foto versturen.

Hoe kunt u een foto versturen met een IOS telefoon?

STAP 1

Open de foto app op uw telefoon

STAP 2

Selecteer de foto die u wilt versturen. En tik vervolgens op het omcirkelde pictogram

STAP 3

Selecteer eventueel meerdere foto's die u wilt versturen en tik op het e-mail pictogram om het mail programma te openen

STAP 4

Klik op het veld "aan" en vul het e-mailadres: ABC.studie@wur.nl in. Vul bij het onderwerp uw huishoudnummer. Dit nummer staat op de sticker achter uw naam en op de sticker op het dagboekje. U kunt nu de foto's versturen.

Stap 2: Hoe gaat het invullen van de dagboekjes in zijn werk?

Iedere keer als u iets weggooit weegt u hoeveel gram het is en bepaalt u in welke fase (bijv. geheel ongebruikt of maaltijdresten) en categorieën (bijv. vlees of brood) het hoort. Op het losse A4-tje staan de fases en categorieën uitgelegd. Ook geeft u aan of u uw afval in onze afvalbak gegooid heeft of dat u het op een andere manier "weggooit" b.v. gootsteen, huisdier, composthoop etc.

Bij het wegen is het belangrijk dat u niet uw bord of bakje meeweegt. Zet hiervoor eerst het lege bord of het lege bakje op de weegschaal en zet de weegschaal vervolgens op "0". Nu kunt u de producten op het lege bord of bakje leggen en het gewicht aflezen.

Het bijgeleverde dagboek kunt u op het aanrecht leggen om steeds de weggegooide hoeveelheden op te schrijven.

Stap 3. Hoe gaat het gebruik van de afvalbakken in zijn werk?

Stappenplan:

- Vul de compartimenten met de juiste afvalzakken (de kleur van de stickers op de zak komt overeen met de kleur op de afvalbak)
- Als u iets weggooit doet u dit in het juiste compartiment (zie de uitleg van de verschillende compartimenten/fases op het aparte A4-tje)
- Op de dagen dat u een zak moet verwisselen wisselt u <u>in de avond</u> de zakken, ook al zit er geen of maar een beetje afval in.
- Deze vier kleine afvalzakken stopt u in de grote vuilniszak. Let op dat u alle afvalzakken goed sluit!
- De grote vuilniszak zet u op de afgesproken plek bij uw huis neer

Let op! Vloeistoffen zoals melk, soepen, sappen, frisdrank en alcoholische dranken hoeft u niet in de afvalbakken te gooien. Deze mag u na het fotograferen en wegen weggooien. Noteer dit echter wel in het dagboekje.

In het schema kunt u zien op welke dag u wat moet doen.

Week 1:

Dag	Datum	Wat te doen?	Wat doet u?	Wat doen wij?
Woensdag of donderdag	29 of 30 juni	Thuis zijn op het afgesproken tijdstip		Afvalbakken worden thuisgebracht
Vrijdag	1 juli	Afval verzamelen		
Zaterdag	2 juli	Afval verzamelen		
Zondag	3 juli	Afval verzamelen	In de avond (vlak voor het slapen gaan) de zakken verwisselen en afval buiten zetten (buiten zetten mag ook de volgende ochtend)	
Maandag	4 juli	Afval verzamelen		Afval van vrijdag, zaterdag en zondag wordt opgehaald
Dinsdag	5 juli	Afval verzamelen	In de avond (vlak voor het slapen gaan) zakken verwisselen en afval buiten zetten (buiten zetten mag ook de volgende ochtend)	
Woensdag	6 juli	Afval verzamelen		Afval van maandag en dinsdag wordt opgehaald
Donderdag	7 juli	Afval verzamelen	In de avond (vlak voor het slapen gaan) zakken verwisselen en afval buiten zetten (buiten zetten mag ook de volgende ochtend)	

Week 2:

Dag	Datum	Wat te doen?	Wat doet u?	Wat doen wij?
Vrijdag	8 juli	Afval verzamelen		Afval van woensdag en donderdag wordt opgehaald
Zaterdag	9 juli	Afval verzamelen		
Zondag	10 juli	Afval verzamelen	In de avond (vlak voor het slapen gaan) zakken verwisselen en afval buiten zetten (buiten zetten mag ook de volgende ochtend)	
Maandag	11 juli	Afval verzamelen		Afval van vrijdag, zaterdag en zondag wordt opgehaald
Dinsdag	12 juli	Afval verzamelen	In de avond (vlak voor het slapen gaan) zakken verwisselen en afval buiten zetten (buiten zetten mag ook de volgende ochtend)	
Woensdag	13 juli	Afval verzamelen		Afval van maandag en dinsdag wordt opgehaald
Donderdag	14 juli	Afval verzamelen	In de avond (vlak voor het slapen gaan) zakken verwisselen en afval buiten zetten (buiten zetten mag ook de volgende ochtend)	
Vrijdag	15 juli	Thuis zijn op het afgesproken tijdstip		Afval van woensdag en donderdag wordt opgehaald samen met de afvalbakken en de ingevulde formulieren.

Voorbeelden:

Voorbeeld 1

Het is vrijdag 1 juli en u wilt een appel eten. U ziet echter dat de appel beschimmeld is en wilt deze weggooien.

Eerst maakt u een foto van de appel die u op de placemat heeft gelegd. Vervolgens weegt u deze appel. De appel weegt 128 gram. Vul dit in de groene kolom in. Zoek vervolgens op bij welke fase de appel hoort. Dit is fase 1 (geheel ongebruikt voedsel). Dit vult u in de roze kolom in. Kijk vervolgens bij welke categorie de appel hoort. Dit is fruit dus categorie 2. Dat vult u in de blauwe kolom in. Geef op het formulier ook aan of u deze appel in de afvalbak gooit of dat u deze wellicht aan uw huisdier geeft.

Als u de appel niet aan uw huisdier geeft dan gooit u deze in de afvalbak geheel ongebruikt voedsel (met de rode sticker).

Voorbeeld 2

Het is vrijdag 1 juli en u bent andijviestamppot aan het maken. Er zit echter teveel gesneden andijvie in de zak. U wilt dus een deel weggooien of aan huisdieren geven. Eerst legt u de resten andijvie op een bord. U maakt een foto van het bord dat u op de placemat heeft gezet. Vervolgens weegt u deze andijvie. De andijvie weegt 80 gram. Vul dit in de groene kolom in. Zoek vervolgens op bij welke fase de andijvie hoort. Dit is fase 2 (deels gebruikt voedsel). Dit vult u in de roze kolom in. Kijk vervolgens bij welke categorie de andijvie hoort. Dit is groente dus categorie 1. Dat vult u in de blauwe kolom in.

Als u besluit om het weg te gooien dan gooit u het in de bak deels gebruikt voedsel (met de gele sticker). Als u het aan uw huisdier wilt geven dan vult u in de kolom "Nee" in en maakt u er een opmerking bij dat u dit aan uw huisdier gegeven heeft.

Voorbeeld 3

Het is vrijdag 1 juli en na het eten ligt er nog een restje op het bord. Het restje bestaat uit stamppot en een stukje worst. U maakt een foto van het bord dat u op de placemat heeft gezet. Vervolgens weegt u dit totale restje, zonder het bord mee te wegen. Bij producten waar het makkelijk te scheiden is zoals in dit geval de stamppot en de worst, weegt u deze ook afzonderlijk. Het restje stamppot weegt 140 gram en het stukje worst weegt 60 gram. Vul dit in de groene kolom in. Zoek vervolgens op bij welke fase de resten horen. Dit is beide fase 3 (maaltijdresten). Dit vult u in de roze kolom in. Kijk vervolgens bij welke categorie de maaltijdresten horen. De stamppot hoort bij categorie 1 en 3 (groente en aardappelen). De worst hoort bij categorie 5 (vlees). Dat vult u in de blauwe kolom in. U moet dit afval beide in de bak maaltijdresten gooien (met de blauwe sticker).

Voorbeeld 4

Het is vrijdag 1 juli en na het eten neemt u nog een glaasje melk. U krijgt het glas echter niet helemaal leeg en gooit de rest weg. Maak een foto van het glas melk met daarachter duidelijk zichtbaar de placemat (zoals in de voorbeeldfoto). Weeg vervolgens deze melk door eerst een leeg glas op de weegschaal te zetten en de weegschaal vervolgens op "0" te zetten. Schenk vervolgens de melk in dit lege glas. Het restje melk weegt 30 gram. Vul dit in de groene kolom in. Zoek vervolgens op bij welke fase de melk hoort. Dit is fase 3 (maaltijdresten). Dit vult u in de roze kolom in. Kijk vervolgens bij welke categorie de melk hoort. Dit zijn dranken dus categorie 10. Dat vult u in de blauwe kolom in.

Omdat het hier om een vloeistof gaat hoeft u dit niet in de afvalbakken te gooien maar mag u het gewoon op de gebruikelijke manier weggooien. Vul dit echter wel in op het formulier.

Voorbeeld 5

Het is zondag 3 juli en na het eten ligt er nog een restje nasi op het bord. Maak een foto van het bord nasi die u op de placemat heeft gezet. Omdat nasi niet makkelijk te scheiden is, weegt u deze nasi in zijn geheel, zonder het bord mee te wegen. Het restje nasi weegt 90 gram. Vul dit in de groene kolom in. Zoek vervolgens op bij welke fase de nasi hoort. Dit is fase 3 (maaltijdresten). Dit vult u in de roze kolom in. Kijk vervolgens bij welke categorie de nasi hoort. Dit zijn meerdere categorieën namelijk categorie 1(groente), categorie 4 (rijst) en categorie 5(vlees). Dat vult u in de blauwe kolom in. U moet dit afval vervolgens in de bak maaltijdresten gooien (met de blauwe sticker).

Let op! Weeg steeds alleen het product en niet het bord of het glas!!

VOORBEELD TABEL:

Datum	Gewicht (in gram)	Fase (nummer)	Categorie (nummer)	Heeft u dit in onze afvalbak gegooid? ja/nee	Indien nee graag aangeven wat de reden hiervan is
Vrijdag 1 juli	128	1	2	Ja	
Vrijdag 1 juli	80	2	1	Nee	Aan huisdier gegeven
Vrijdag 1 juli	140	3	1,3	Ja	
Vrijdag 1 juli	60	3	5	Ja	
Vrijdag 1 juli	30	3	10	Nee	Dit is een vloeistof
Zondag 3 juli	90	3	1,4,5	Ja	

Veelgestelde vragen

Ik heb een klein stukje banaan over. Willen jullie dat we deze ook fotograferen, wegen en weggooien?

Ja, van al het eten dat u in huis heeft maar wat niet opgegeten wordt, willen we graag dat u dit fotografeert, weegt en noteert en in de juiste bak weggooit (in dit geval deels gebruikt voedsel).

Moet ik ook dranken zoals water, frisdrank, koffie en thee noteren en in jullie afvalbakken gooien?

Dranken die voornamelijk uit water bestaan zoals water, koffie, thee en siroop hoeft u niet mee te tellen. Overige dranken zoals melk, yoghurtdrank of frisdrank tellen wel mee. U hoeft deze niet in onze afvalbakken weg te gooien omdat het om een vloeistof gaat. U fotografeert en weegt het echter wel en noteert dit in het dagboekje.

Ik heb voor een recept geschilde appels of ontvelde tomaten nodig. Moeten de appelschillen en de vellen dan ook genoteerd worden?

Nee, deze hoeft u niet mee te tellen. U heeft namelijk de appels en tomaten gekocht met als doel om de schillen en vellen niet te consumeren. Hetzelfde geldt overigens als u altijd uw appel of peer schilt voordat u deze eet.

Als ik een prei snij, wat moet ik dan weggooien?

Als u een prei snijdt dan hoeft u de niet-eetbare delen niet te fotograferen, wegen en weg te gooien in onze afvalbakken. Dit is immers geen voedsel dat u gekocht heeft om op te eten. Eet u echter niet alle eetbare delen op, dan dient u deze wel te fotograferen, wegen en weg te gooien in onze afvalbak bij deels gebruikt voedsel.

Ik heb worstjes die over de datum zijn, moet ik deze inclusief verpakking weggooien?

Als u worstjes of andere producten heeft die over de datum zijn mag u deze in de originele verpakking laten zitten en fotograferen, wegen en weggooien. Als u het zelf prettiger vindt om het afval te scheiden dan mag dat uiteraard ook. U kunt ook het gewicht op de verpakking noteren.

Ik heb een netje met mandarijnen gekocht en er zitten 3 rotte mandarijnen in, moet ik deze dan ook noteren?

Ja deze 3 mandarijnen moet u ook fotograferen, wegen en weggooien in onze afvalbak (fase geheel ongebruikt voedsel), deze mandarijnen heeft u immers gekocht om op te eten. Als u het in de winkel al had gezien, had u een ander netje uitgezocht.

Er is een restje rijst overgebleven in de pan, hoe kan ik dit het beste fotograferen en wegen?

Zet een leeg bord op de weegschaal en zet de weegschaal vervolgens op "0". Schep het restje rijst op het bord. En noteer het gewicht en de fase en categorie. Zet het bord op de placemat en maak een foto. Gooi het restje rijst vervolgens weg in de afvalbak maaltijdresten.

Ik eet een dag niet thuis, is dat een probleem?

Dat is geen probleem. Als u ergens anders eet en daar eten weggegooid moet worden, valt dat onder een andere categorie (bijvoorbeeld cateringafval of restaurantafval). Die hoeft u dus niet te fotograferen, wegen en weg te gooien in onze afvalbakken. Alles wat u die dag thuis weggooit uiteraard wel.

Wat moeten we doen als mensen ziek zijn en niet mee eten?

U hoeft niets bijzonders te noteren. Gooi gewoon weg wat u weg wilt gooien. Het komt vaker voor dat er meer of minder mensen dan gepland mee-eten.

Als ik brood of andere etensresten voer aan de eenden, vogels of huisdieren, wat moet ik daar mee doen?

Al het eten dat voor menselijke consumptie bedoeld is en niet door mensen opgegeten wordt, telt voor dit onderzoek mee. Fotografeer, weeg dit eten dus voor u het aan de dieren geeft en vul dit in de tabel duidelijk in dat u het niet in onze afvalbakken gooit vanwege de huisdieren.

Wat moet ik doen met een boterham die in mijn lunchtrommel is blijven zitten?

Deze boterham moet u wel meetellen (samen met het beleg) en fotograferen, wegen en weggooien in de fase maaltijdresten.

Ik heb de placemat vergeten erbij te leggen, wat nu?

Niets aan te doen. Probeer er de volgende keer aan te denken.

Mag ik de foto's ook allemaal in één keer sturen of moet het gelijk als ik iets weggooi?

We willen u vragen om in ieder geval na 2 dagen een foto naar ons toe te sturen. Mochten de foto's namelijk niet aan de criteria voldoen dan kunnen we dit nog aan u doorgeven zodat u hier rekening mee kunt houden bij de volgende foto's. Ook willen we u vragen om per item een foto te maken en niet alles op 1 placemat te leggen.

Ik heb helemaal niets weggegooid, moeten we de afvalzakken toch bij jullie inleveren?

Ja, stop ook de lege zakken in de grote vuilniszak zodat we alles compleet hebben. Stop er eventueel iets zwaars in zodat ze niet wegwaaien.

Wat moet ik doen met de ingevulde lijsten?

U kunt deze lijsten in bijgeleverde envelop stoppen en meegeven als de afvalbakken worden opgehaald.

Ik ben niet thuis op het moment dat de afvalzakken opgehaald worden, wat moet ik nu doen?

U kunt de afvalzakken gewoon buiten uw huis neerzetten in de daarvoor meegeleverde vuilniszak. Wij komen deze dan ophalen. U kunt zelf aangeven waar u de zakken neerzet zodat wij ze kunnen vinden.

Mocht u na het lezen van deze veel gestelde vragen en de voorbeelden nog meer vragen hebben, dan kunt u het beste een e-mail sturen naar ADC.studie@wur.nl

Succes!

Namens de ADC-studie

Annex 7- Stages and food categories used in the main study (in Dutch)

**Uitleg fases:**

1) **Geheel ongebruikt voedsel:** Voedsel dat nog helemaal niet is gebruikt (b.v. ongeopende verpakkingen, beschimmelde appel, uitgedroogde prei)
2) **Deels gebruikt voedsel:** Voedsel dat weggegooid wordt als het deels gebruikt is (b.v. broodkapjes, halve verpakking vleeswaren, een ½ ui of courgette die niet gebruikt wordt om het gerecht te bereiden)
3) **Maaltijdresten:** Maaltijdresten die op het bord of in de pan blijven liggen na het eten (b.v. restjes aardappel, rijst, stamppot etc. of brood dat in de lunchtrommel terug naar huis komt)
4) **Restjes na bewaring:** Restjes / kliekjes die weggegooid worden nadat ze bewaard zijn geweest (b.v. kliekjes die u na het eten in de koelkast heeft bewaard maar vervolgens toch niet opeet)

Uitleg voedingscategorieën:

1) **Groente** (vers / pot / blik / diepvries)
2) **Fruit** (vers / pot / blik / gedroogd / diepvries)
3) **Aardappel en aardappelproducten** (frietjes, voorgekookte krieltjes, etc)
4) **Pasta en rijst** (inclusief wraps, couscous, etc)
5) **Vlees, vleesvervangers, en vis**
6) **Brood, broodbeleg** (vleeswaren, zoet beleg, pakjes kaas, etc) **en ontbijtgranen** (muesli, cruesli, brinta, etc)
7) **Zuivelproducten** (yoghurt, vla, etc) **kaas, en eieren**
8) **Soepen en sauzen** (ketchup, mayonnaise, cocktailsaus, etc.)
9) **Snoep** (snoepjes, chocolade repen, etc.), **koekjes, tussendoortjes, chips en nootjes**
10) **Dranken** (melk, sappen, frisdrank, alcoholische dranken; hier valt NIET onder water/thee/koffie/siroop)

Annex 8 - Example photographs in the photo study
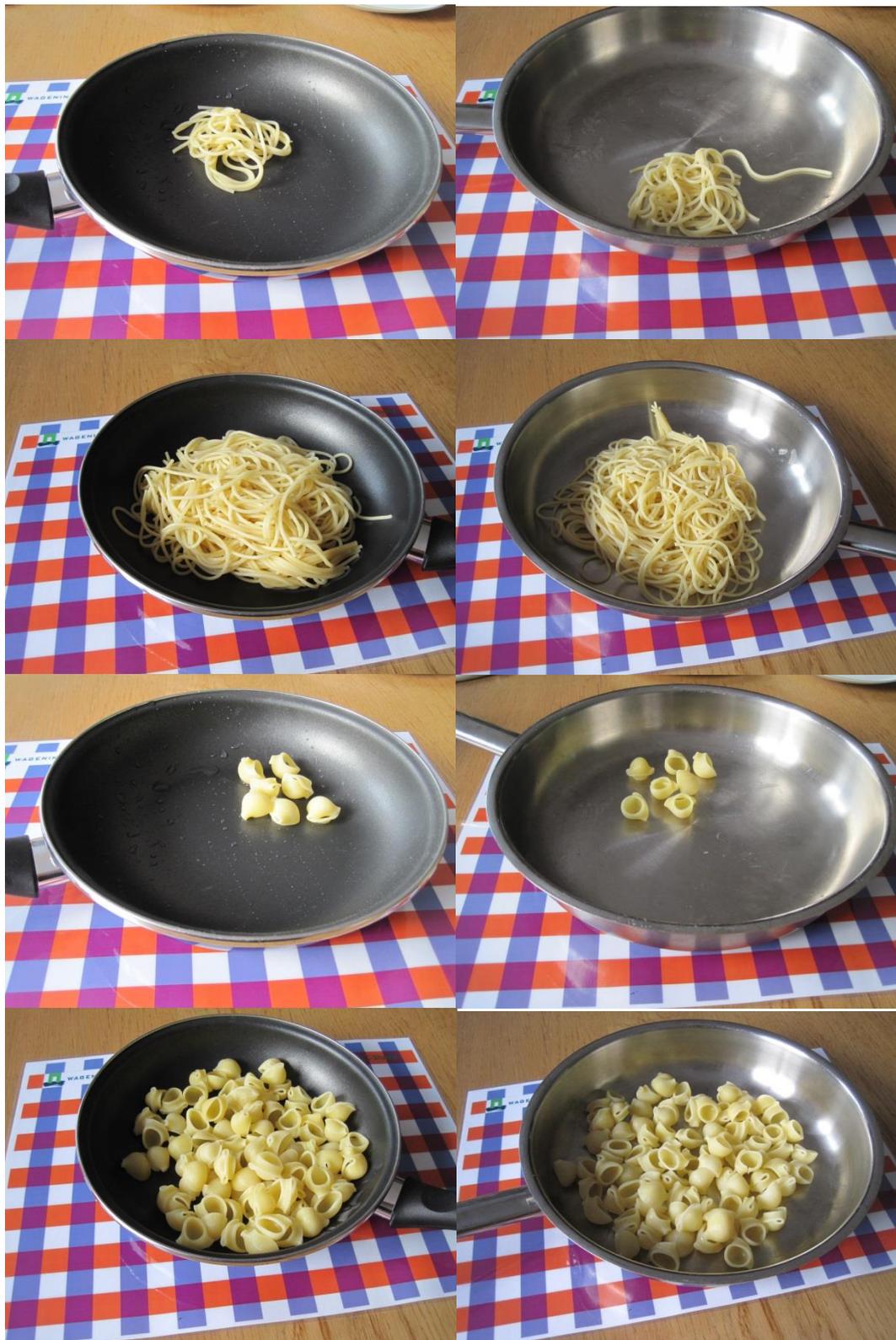
Annex 9 - Survey (main study)

9.1- Initial survey at the start of the study

Welkom bij deze vragenlijst. Wij willen graag weten hoe er in uw huishouden met voedsel omgegaan wordt, als eerste onderdeel van de ADC studie. Wij vragen u daarom om deze vragenlijst in te vullen. Er zijn geen goede of foute antwoorden, het gaat erom dat we begrijpen hoe er in uw huishouden omgegaan wordt met voedsel. Het invullen van deze vragenlijst duurt ongeveer 15 minuten. Alvast erg bedankt voor uw medewerking!

Vul hieronder uw huishoudnummer in. U kunt dit nummer vinden in de aanhef van de e-mail die u heeft gekregen, achter uw naam.

Allereerst willen we weten hoe vaak er, gemiddeld, in uw huishouden levensmiddelen uit bepaalde categorieën worden gegeten. Hoe vaak worden er in uw huishouden onderstaande levensmiddelen gegeten?

	Dagelijks	Meerdere keren per week	1 keer per week	Meerdere keren per maand	1 keer per maand	Meerdere keren per jaar	(Bijna) nooit
Verse groenten	❍	❍	❍	❍	❍	❍	❍
Niet-verse groenten (pot / blik / diepvries)	❍	❍	❍	❍	❍	❍	❍
Vers fruit	❍	❍	❍	❍	❍	❍	❍
Niet-vers fruit (pot / blik / gedroogd / diepvries)	❍	❍	❍	❍	❍	❍	❍
Aardappelen	❍	❍	❍	❍	❍	❍	❍
Aardappelproducten (frietjes, voorgekookte krieltjes, etc)	❍	❍	❍	❍	❍	❍	❍
Pasta	❍	❍	❍	❍	❍	❍	❍
Rijst (inclusief wraps, couscous, etc)	❍	❍	❍	❍	❍	❍	❍
Vlees / vleesvervangers	❍	❍	❍	❍	❍	❍	❍
Vis	❍	❍	❍	❍	❍	❍	❍
Broodbeleg (vleeswaren, zoet beleg, plakjes kaas,	❍	❍	❍	❍	❍	❍	❍

etc)							
Brood	○	○	○	○	○	○	○
Ontbijtgranen (muesli, cruesli, brinta, etc)	○	○	○	○	○	○	○
Yoghurt, vla, etc	○	○	○	○	○	○	○
Kaas (broodbeleg uitgezonderd)	○	○	○	○	○	○	○
Eieren	○	○	○	○	○	○	○
Soepen	○	○	○	○	○	○	○
Sauzen (ketchup, mayonnaise, cocktailsaus etc)	○	○	○	○	○	○	○
Snoep (snoepjes, chocolade repen etc) / koekjes / tussendoortjes	○	○	○	○	○	○	○
Chips / nootjes	○	○	○	○	○	○	○
Niet-alcoholische dranken (melk, sappen, frisdrank, hier valt NIET onder water/thee/koffie/siroop)	○	○	○	○	○	○	○
Alcoholische dranken	○	○	○	○	○	○	○

Nu komen er vragen over levensmiddelen die wel gekocht zijn met de bedoeling om opgegeten te worden, maar die uiteindelijk niet gegeten worden.

Het komt in elk huishouden wel voor dat er iets gekocht is om opgegeten te worden, wat uiteindelijk toch weggegooid wordt. We willen in kaart brengen om welke soort producten het gaat, en wanneer deze weggegooid worden, om meer inzicht te krijgen in dit veelvoorkomende gedrag.

In dit onderzoek gaat het om al het voedsel dat bedoeld was om op te eten en niet gegeten wordt. Het maakt niet uit of u het voedsel normaal gesproken weggooit in de afvalbak, GFT-bak, op de composthoop gooit, of aan (huis)dieren geeft.

Let op! Het gaat hierbij alleen om voedselresten die eetbaar zijn of eetbaar waren. Botten, schillen, pitten, stronken b.v. zijn niet eetbaar, dus die tellen niet mee. Maar producten die u weggooit omdat ze bedorven of over de datum zijn, moet u wel meenemen in uw antwoorden. Het gaat alleen om eten dat thuis wordt weggegooid. Dus niet als u bijv. uit eten gaat of uw lunch buitenshuis nuttigt.

Allereerst enkele algemene vragen over de voedingsmiddelen die gekocht zijn met de bedoeling opgegeten te worden, maar die uiteindelijk niet gegeten worden.

	Beduidende hoeveelheid	Behoorlijk wat	Kleine hoeveelheid	Bijna niets	Niets
Hoeveel van het totale aantal voedingsmiddelen dat in uw huishouden gekocht wordt, wordt weggegooid?	○	○	○	○	○

	Geen	5% of minder	6% tot 15%	16% tot 30%	31% tot 50%	meer dan 50%
Welk percentage van het voedsel dat in uw huishouden gekocht wordt, wordt weggegooid?	○	○	○	○	○	○

	Regelmatig	Soms	Sporadisch	Nooit
Hoe vaak wordt er in uw huishouden voedsel weggegooid?	○	○	○	○

Hieronder staat aangegeven welke categorieën we hebben om voedselafval in te delen. Lees deze aub rustig door. In de volgende vragen zullen deze categorieën gebruikt worden.

1) Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (b.v. ongeopende verpakkingen, beschimmelde appel, uitgedroogde prei)

2) Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (b.v. broodkapjes, halve verpakking vleeswaren, een ½ ui of courgette die niet gebruikt wordt om het gerecht te bereiden)

3) Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten (bijv. restjes aardappel, rijst, stamppot etc. of brood dat in de lunchtrommel terug naar huis komt)

4) Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest (bijv. kliekjes die u na het eten in de koelkast heeft bewaard maar vervolgens toch niet opeet)

U krijgt nu vragen per product soort. Let er bij het beantwoorden dus op over welk product het gaat!

Verse groenten

Welk deel van de verse groenten wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide verse groenten	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de verse groenten dat in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

- ❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv een hele prei)
- ❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv halve ui)
- ❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
- ❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Niet-verse groenten (pot / blik / diepvries)

Welk deel van de niet-verse groenten (pot / blik / diepvries) wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide niet-verse groenten	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de niet-verse groenten dat in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

- ❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv ongeopend pak diepvriesspinazie)
- ❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half gebruikt pak diepvriesspinazie)
- ❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
- ❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Vers fruit

Welk deel van het vers fruit wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooid vers fruit	○	○	○	○	○	○

In welke categorie valt (het merendeel van) het verse fruit dat in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv hele appel)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv halve appel die niet in gerecht wordt gebruikt)
❑ Etensresten: etensresten die overblijven na het eten (bv half opgegeten appel)
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Niet-vers fruit (pot / blik / gedroogd / diepvries)

Welk deel van het niet-vers fruit (pot / blik / gedroogd / diepvries) wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooid niet-vers fruit	○	○	○	○	○	○

In welke categorie valt (het merendeel van) het niet-verse fruit dat in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv ongeopend blik fruit)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv halfvol blik fruit)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Aardappelen

Welk deel van de aardappelen wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide aardappelen	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de aardappelen die in uw huishouden worden weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak aardappelen)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak aardappelen)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Aardappelproducten (frietjes etc)

Welk deel van de aardappelproducten (frietjes, etc) wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide aardappelproducten	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de aardappelproducten die in uw huishouden worden weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak frietjes)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak frietjes)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Pasta

Welk deel van de pasta wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide pasta	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de pasta die in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak pasta)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak pasta)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Rijst (inclusief wraps, couscous, etc)

Welk deel van de rijst (inclusief wraps, couscous, etc) wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Onveveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide rijst	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de rijst die in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak rijst)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak rijst)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Vlees / vleesvervangers

Welk deel van het vlees / vleesvervangers wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooid vlees / vleesvervangers	○	○	○	○	○	○

In welke categorie valt (het merendeel van) het vlees / vleesvervangers dat in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

- ❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv pak worstjes)
- ❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak worstjes)
- ❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
- ❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Vis

Welk deel van de vis wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide vis	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de vis die in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

- ❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pakje vis)
- ❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pakje vis)
- ❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
- ❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Broodbeleg (vleeswaren, zoet beleg, plakjes kaas, etc)

Welk deel van het broodbeleg (vleeswaren, zoet beleg, plakjes kaas, etc) wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooid broodbeleg	○	○	○	○	○	○

In welke categorie valt (het merendeel van) het broodbeleg dat in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pakje vleeswaren)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pakje vleeswaren)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Brood

Welk deel van het brood wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooid brood	○	○	○	○	○	○

In welke categorie valt (het merendeel van) het brood dat in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel brood)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv paar sneden brood)
❑ Maaltijdresten: Maaltijdresten die op het bord blijven liggen na het eten (bv broodkorstjes op het bord)
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Ontbijtgranen (muesli, cruesli, brinta, etc)

Welk deel van de ontbijtgranen (muesli, cruesli, brinta, etc) wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide ontbijtgranen	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de ontbijtgranen die in uw huishouden worden weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak muesli)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak muesli)
❑ Maaltijdresten: Maaltijdresten die op het bord blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Yoghurt vla, etc

Welk deel van de yoghurt, vla, etc wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide yoghurt / vla	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de yoghurt, vla, etc. die in uw huishouden worden weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak vla)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak vla)
❑ Maaltijdresten: Maaltijdresten die op het bord blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Kaas (broodbeleg uitgezonderd)

Welk deel van de kaas (broodbeleg uitgezonderd) wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide kaas	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de kaas die in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv hele brie)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half stuk brie)
❑ Maaltijdresten: Maaltijdresten die op het bord blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Eieren

Welk deel van de eieren wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide eieren	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de eieren die in uw huishouden zijn weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv hele eieren)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv eiwit)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Soepen

Welk deel van de soepen wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide soep	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de soep die in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak soep)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak soep)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Sauzen (ketchup, mayonnaise, cocktailsaus, etc)

Welk deel van de sauzen (ketchup, mayonnaise, cocktailsaus, etc) wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide saus	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de saus die in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel potje saus)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half potje saus)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Snoep (snoepjes, chocolade repen, etc) / koekjes / tussendoortjes

Welk deel van het snoep (snoepjes, chocolade repen etc) / koekjes / tussendoortjes wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide snoep / koekjes / tussendoortjes	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de snoep / koekjes / tussendoortjes die in uw huishouden worden weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

- ❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak koekjes)
- ❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak koekjes)
- ❑ Etensresten: Resten die zijn overgebleven bij het eten
- ❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Chips / nootjes

Welk deel van de chips / nootjes wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide chips / nootjes	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de chips / nootjes die in uw huishouden worden weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

- ❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv hele zak chips)
- ❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv halve zak chips)
- ❑ Etensresten: Resten die zijn overgebleven bij het eten
- ❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Niet-alcoholische dranken (sappen, frisdrank, hier valt NIET onder water/thee/koffie/siroop)

Welk deel van de niet-alcoholische dranken (melk, sappen, frisdrank, hier valt NIET onder water/thee/koffie/siroop) wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide niet-alcoholische dranken	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de niet-alcoholische drank die in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

- ❑ Geheel ongebruikt voedsel: Drank die nog helemaal niet is gebruikt (bv heel pak melk)
- ❑ Deels gebruikt voedsel: Drank die weggegooid wordt als het deels gebruikt is (bv half pak melk)
- ❑ Maaltijdresten: Drank die in het glas of beker is achtergebleven
- ❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Alcoholische dranken

Welk deel van de alcoholische dranken wordt in uw huishouden ongeveer weggegooid van wat er in uw huishouden beschikbaar is:

	Helemaal niets / niet van toepassing	Vrijwel niets	Ongeveer een tiende	Ongeveer een kwart	Ongeveer de helft	Meer dan de helft
Hoeveelheid weggegooide alcoholische dranken	○	○	○	○	○	○

In welke categorie valt (het merendeel van) de alcoholische drank die in uw huishouden wordt weggegooid? Kruis de categorie aan die het meest voorkomt. Als er meerdere categorieën evenveel voorkomen, kunt u meerdere antwoorden aankruisen.

- ❑ Geheel ongebruikt voedsel: Drank die nog helemaal niet is gebruikt (bv hele fles wijn)
- ❑ Deels gebruikt voedsel: Drank die weggegooid wordt als het deels gebruikt is (bv halve fles wijn)
- ❑ Maaltijdresten: Drank die in het glas of beker is achtergebleven
- ❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Tot slot nog enkele vragen over uzelf.

Wat is uw geslacht?

- ○ Man
- ○ Vrouw

Hoe oud bent u?

Ik ben zelf ... jaar:

Hoeveel volwassenen wonen in uw huishouden (uzelf meegerekend)? Onder volwassene valt iedereen van 18 jaar en ouder.

Hoeveel kinderen (jonger dan 18 jaar) wonen in uw huishouden?

Is er een wisselend aantal mensen in uw huishouden, bijvoorbeeld doordat huisgenoten een deel van de week bij u wonen en een deel elders? Dit kunt u hieronder opschrijven.

Hoe oud is/zijn de andere volwassenen in uw huishouden?De andere volwassenen zijn ... jaar.Bij meerdere antwoorden, vul aub de getallen in gescheiden door een ;

Hoe oud zijn de kinderen in uw huishouden?Bij meerdere antwoorden, vul aub de getallen in gescheiden door een ;

Hartelijk bedankt voor het invullen van deze vragenlijst. Mocht u nog opmerkingen hebben voor de onderzoekers, dan kunt u deze hieronder invullen.

9.2- Survey questions after each week

Deze vragenlijst gaat over hoe er in de afgelopen week met voedsel is omgegaan in uw huishouden. Dit gaat dus over de eerste week van deze studie. Sommige mensen hebben instructies later gekregen en zijn daardoor later aan de studie begonnen. Is dat voor u het geval? Wacht u dan tot de eerste week voorbij is, en vul dan deze vragenlijst in.

Wij willen u vragen om de vragen te beantwoorden zoals u het zich herinnert, dus op basis van uw geheugen zonder terug te kijken in de vuilnisbak etc.

Alvast erg bedankt voor uw medewerking!

Vul hieronder uw huishoudnummer in. U kunt dit nummer vinden in de aanhef van de e-mail die u heeft gekregen, achter uw naam.

Op hoeveel dagen is er in uw huishouden de afgelopen week de hoofdmaaltijd thuis gegeten?

- ○ elke dag
- ○ 6 dagen
- ○ 5 dagen
- ○ 4 dagen
- ○ 3 dagen
- ○ 2 dagen
- ○ 1 dag
- ○ geen dag

Op hoeveel in de afgelopen week hebben alle huisgenoten meegegeten van de hoofdmaaltijd?

- ○ elke dag
- ○ 6 dagen
- ○ 5 dagen
- ○ 4 dagen
- ○ 3 dagen
- ○ 2 dagen
- ○ 1 dag
- ○ geen dag

Op hoeveel dagen in de afgelopen week waren er gasten of bezoekers (mensen die niet tot uw huishouden behoren) die tijdens de hoofdmaaltijd mee aten?

- ○ elke dag
- ○ 6 dagen
- ○ 5 dagen
- ○ 4 dagen
- ○ 3 dagen
- ○ 2 dagen
- ○ 1 dag
- ○ geen dag

Het gaat weer over levensmiddelen die gekocht zijn met de bedoeling om opgegeten te worden, maar die uiteindelijk niet gegeten worden. Het maakt hierbij niet uit of u het voedsel heeft weggegooid in de afvalbak, GFT-bak, op de composthoop heeft gegooid, of aan (huis)dieren heeft gegeven. Het gaat alleen om voedselresten die eetbaar zijn of eetbaar waren. Botten, schillen, pitten, stronken b.v. zijn niet eetbaar, dus die tellen niet mee. Maar producten die u weggooit omdat ze bedorven of over de datum zijn, moet u wel meenemen in uw antwoorden. Het gaat alleen om eten dat thuis wordt weggegooid. Dus niet als u bijv. uit eten gaat of uw lunch buitenshuis nuttigt.

Klikt u nu hieronder aan welke producten er in uw huishouden de afgelopen week zijn weggegooid.

- ❑ Verse groenten
- ❑ Niet-verse groenten (pot / blik / diepvries)
- ❑ Vers fruit
- ❑ Niet-vers fruit (pot / blik / gedroogd / diepvries)
- ❑ Aardappelen
- ❑ Aardappelproducten (frietjes, voorgekookte krieltjes, etc)
- ❑ Pasta
- ❑ Rijst (inclusief wraps, couscous, etc)
- ❑ Vlees / vleesvervangers
- ❑ Vis
- ❑ Broodbeleg (vleeswaren, zoet beleg, plakjes kaas, etc)
- ❑ Brood
- ❑ Ontbijtgranen (muesli, cruesli, brinta, etc)
- ❑ Yoghurt, vla, etc
- ❑ Kaas (broodbeleg uitgezonderd)
- ❑ Eieren
- ❑ Soepen
- ❑ Sauzen (ketchup, mayonnaise, cocktailsaus, etc)
- ❑ Snoep (snoepjes, chocolade repen etc) / koekjes / tussendoortjes
- ❑ Chips / nootjes
- ❑ Niet-alcoholische dranken (melk, sappen, frisdrank, hier valt NIET onder water/thee/koffie/siroop)
- ❑ Alcoholische dranken

Hieronder staat ter herinnering aangegeven welke categorieën we hebben om voedselafval in te delen. Lees deze a.u.b. rustig door. In de volgende vragen zullen deze categorieën gebruikt worden. 1) Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (b.v. ongeopende verpakkingen, beschimmelde appel, uitgedroogde prei) 2) Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (b.v. broodkapjes, halve verpakking vleeswaren, een ½ ui of courgette die niet gebruikt wordt om het gerecht te bereiden) 3) Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten (bijv. restjes aardappel, rijst, stamppot etc. of brood dat in de lunchtrommel terug naar huis komt) 4) Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest (bijv. kliekjes die u na het eten in de koelkast heeft bewaard maar vervolgens toch niet opeet)

U krijgt nu vragen per product dat u heeft weggegooid. Let dus goed op over welk product het gaat!

Verse groenten

Hoeveel verse groenten is in de afgelopen week weggegooid in uw huishouden?

○ Minder dan een opscheplepel
○ 1 tot 2 opscheplepels
○ 2 tot 4 opscheplepels
○ 4 tot 6 opscheplepels
○ Meer dan 6 opscheplepels

In welke categorie viel (het merendeel van) de verse groenten dat is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv een hele prei)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv halve ui)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Niet-verse groenten (pot / blik / diepvries)

Hoeveel niet-verse groenten (pot / blik / diepvries) is in de afgelopen week weggegooid in uw huishouden?

○ Minder dan een opscheplepel
○ 1 tot 2 opscheplepels
○ 2 tot 4 opscheplepels
○ 4 tot 6 opscheplepels
○ Meer dan 6 opscheplepels

In welke categorie viel (het merendeel van) de niet-verse groenten dat is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv ongeopend pak diepvriesspinazie)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half gebruikt pak diepvriesspinazie)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Vers fruit

Hoeveel vers fruit is in de afgelopen week weggegooid in uw huishouden?Een appel of banaan is bv een stuk fruit. Van heel klein fruit, zoals aardbeien en druiven, telt een schaaltje als '1 stuk'.

- ○ Ongeveer een kwart stuk fruit of minder
- ○ Ongeveer een half stuk fruit
- ○ Ongeveer 1 stuk fruit
- ○ 2 tot 4 stuks fruit
- ○ Meer dan 4 stuks fruit

In welke categorie viel (het merendeel van) het verse fruit dat is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

- ❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv hele appel)
- ❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv halve appel die niet in gerecht wordt gebruikt)
- ❑ Etensresten: etensresten die overblijven na het eten (bv half opgegeten appel)
- ❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Niet-vers fruit (pot / blik / gedroogd / diepvries)Hoeveel niet-vers fruit (pot / blik / gedroogd / diepvries)

Hoeveel niet-vers fruit is in de afgelopen week weggegooid in uw huishouden? Een peer of perzik uit blik is bv een stuk fruit. Van heel klein fruit, zoals bosbessen en mandarijnpartjes, telt een schaaltje als '1 stuk'.

- ○ Ongeveer een kwart stuk fruit of minder
- ○ Ongeveer een half stuk fruit
- ○ Ongeveer 1 stuk fruit
- ○ 2 tot 4 stuks fruit
- ○ Meer dan 4 stuks fruit

In welke categorie viel (het merendeel van) het niet-verse fruit dat is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

- ❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv ongeopend blik fruit)
- ❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv halfvol blik fruit)
- ❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
- ❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Aardappelen

Hoeveel aardappelen zijn in de afgelopen week weggegooid in uw huishouden?

- ❍ Minder dan een opscheplepel
- ❍ 1 tot 2 opscheplepels
- ❍ 2 tot 4 opscheplepels
- ❍ 4 tot 6 opscheplepels
- ❍ Meer dan 6 opscheplepels

In welke categorie viel (het merendeel van) de aardappelen die zijn weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

- ❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak aardappelen)
- ❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak aardappelen)
- ❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
- ❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Aardappelproducten (frietjes voorgekookte krieltjes, etc)

Hoeveel aardappelproducten (frietjes, voorgekookte krieltjes, etc) zijn in de afgelopen week weggegooid in uw huishouden?

- ❍ Minder dan 10 frietjes / krieltjes / stuks
- ❍ 10 tot 25 frietjes / krieltjes / stuks
- ❍ Meer dan 25 frietjes / krieltjes / etc (ongeveer een half pak van 750 gram)
- ❍ Een heel pak (750 gram) frietjes / krieltjes / etc
- ❍ Meer dan een heel pak (750 gram) frietjes / krieltjes / etc

In welke categorie viel (het merendeel van) de aardappelproducten die zijn weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

- ❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak frietjes)
- ❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak frietjes)
- ❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
- ❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Pasta

Hoeveel pasta is in de afgelopen week weggegooid in uw huishouden?

○ Minder dan een opscheplepel
○ 1 tot 2 opscheplepels
○ 2 tot 4 opscheplepels
○ 4 tot 6 opscheplepels
○ Meer dan 6 opscheplepels

In welke categorie viel (het merendeel van) de pasta die is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak pasta)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak pasta)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Rijst (inclusief wraps, couscous, etc)

Hoeveel rijst (inclusief wraps, couscous, etc) is in de afgelopen week weggegooid in uw huishouden?

○ Minder dan een opscheplepel
○ 1 tot 2 opscheplepels
○ 2 tot 4 opscheplepels
○ 4 tot 6 opscheplepels
○ Meer dan 6 opscheplepels

In welke categorie viel (het merendeel van) de rijst die is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak rijst)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak rijst)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Vlees / vleesvervangers

Hoeveel vlees / vleesvervangers is in de afgelopen week weggegooid in uw huishouden?Een portie is bijvoorbeeld 1 kipfilet, 1 biefstuk, 1 vegetarische burger, etc. Hoeveelheid van stukjes vlees, bijvoorbeeld gehakt of Quorn, graag zo goed als het kan vertalen naar hoeveelheid hele stukken vlees.

○ Ongeveer een halve portie of minder
○ Ongeveer een hele portie
○ 2 tot 3 porties
○ 4 tot 5 porties
○ Meer dan 5 porties

In welke categorie viel (het merendeel van) het vlees / vleesvervangers dat is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv pak worstjes)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak worstjes)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Vis

Hoeveel vis is in de afgelopen week weggegooid in uw huishouden? Een portie is bijvoorbeeld 1 visfilet, 1 stuk zalm, etc.

○ Ongeveer een halve portie of minder
○ Ongeveer een hele portie
○ 2 tot 3 porties
○ 4 tot 5 porties
○ Meer dan 5 porties

In welke categorie viel (het merendeel van) de vis die is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pakje vis)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pakje vis)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Broodbeleg (vleeswaren, zoet beleg, plakjes kaas, etc)

Hoeveel broodbeleg (vleeswaren, zoet beleg, plakjes kaas, etc) is in de afgelopen week weggegooid in uw huishouden? Een portie is de hoeveelheid broodbeleg die op 1 boterham gebruikt wordt.

○ Ongeveer een halve portie of minder
○ Ongeveer een hele portie
○ 2 tot 3 porties
○ 4 tot 5 porties
○ Meer dan 5 porties

In welke categorie viel (het merendeel van) het broodbeleg dat is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pakje vleeswaren)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pakje vleeswaren)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Brood

Hoeveel brood is in de afgelopen week weggegooid in uw huishouden? Een bolletje / pistolet / krentenbol / etc kunt u gelijkstellen aan een sneetje brood.

○ Minder dan een sneetje brood
○ Eén of enkele sneetjes brood
○ Ongeveer een half brood
○ Ongeveer een heel brood
○ Meer dan een heel brood

In welke categorie viel (het merendeel van) het brood dat is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel brood)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv paar sneden brood)
❑ Maaltijdresten: Maaltijdresten die op het bord blijven liggen na het eten (bv broodkorstjes op het bord)
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Ontbijtgranen (muesli, cruesli, Brinta, etc)

Hoeveel ontbijtgranen (muesli, cruesli, brinta, etc) is in de afgelopen week weggegooid in uw huishouden? Een portie is de hoeveelheid van een bakje ontbijtgranen wat als ontbijt wordt gegeten.

❍ Minder dan een halve portie
❍ Een halve tot anderhalve portie
❍ Meerdere porties (ongeveer een half pak)
❍ Ongeveer een heel pak
❍ Meerdere pakken

In welke categorie viel (het merendeel van) de ontbijtgranen die zijn weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak muesli)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak muesli)
❑ Maaltijdresten: Maaltijdresten die op het bord blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Yoghurt vla, etc

Hoeveel yoghurt, vla, etc is in de afgelopen week weggegooid in uw huishouden? Een portie is een dessertschaaltje met yoghurt / vla / etc.

❍ Minder dan een halve portie
❍ Een halve tot anderhalve portie
❍ Meerdere porties (ongeveer een half literpak)
❍ Ongeveer een heel literpak
❍ Meerdere literpakken

In welke categorie viel (het merendeel van) de yoghurt, vla, etc. die zijn weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak vla)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak vla)
❑ Maaltijdresten: Maaltijdresten die op het bord blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Kaas (broodbeleg uitgezonderd)

Hoeveel kaas (broodbeleg uitgezonderd) is in de afgelopen week weggegooid in uw huishouden? Een handje vol strooikaas kunt u gelijkstellen aan 1 blokje kaas.

○ Minder dan een blokje kaas
○ Ongeveer 1 blokje kaas
○ 1 tot 3 blokjes kaas
○ 4 tot 5 blokjes kaas
○ Meer dan 5 blokjes kaas

In welke categorie viel (het merendeel van) de kaas die is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv hele brie)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half stuk brie)
❑ Maaltijdresten: Maaltijdresten die op het bord blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Eieren

Hoeveel eieren zijn in de afgelopen week weggegooid in uw huishouden?

○ Minder dan 1 ei
○ 1 ei
○ 2 tot 3 eieren
○ 4 tot 5 eieren
○ Meer dan 5 eieren

In welke categorie viel (het merendeel van) de eieren die zijn weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv hele eieren)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv eiwit)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Soepen

Hoeveel soep is in de afgelopen week weggegooid in uw huishouden ?

❍ Minder dan een halve soeplepel
❍ Een halve tot anderhalve soeplepel
❍ Meerdere soeplepels (ongeveer een halve liter)
❍ Ongeveer een hele liter
❍ Meer dan een liter

In welke categorie viel (het merendeel van) de soep die is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak soep)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak soep)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Sauzen (ketchup, mayonaise, cocktailsaus, etc)

Hoeveel saus (ketchup, mayonaise, cocktailsaus, etc) is in de afgelopen week weggegooid in uw huishouden?

❍ Minder dan een eetlepel
❍ 1 tot 3 eetlepels
❍ Meerdere eetlepels (ongeveer een halve pot / fles)
❍ Ongeveer een hele pot / fles
❍ Meer dan een hele pot / fles

In welke categorie viel (het merendeel van) de saus die is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel potje saus)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half potje saus)
❑ Maaltijdresten: Maaltijdresten die op het bord of in de pan blijven liggen na het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Snoep (snoepjes, chocolade repen, etc) / koekjes / tussendoortjes

Hoeveel snoep (snoepjes, chocolade repen etc) / koekjes / tussendoortjes is in de afgelopen week weggegooid in uw huishouden? Een portie is een handje kleine dropjes, een kleine chocoladereep, een koekje, etc.

❍ Ongeveer een halve portie of minder
❍ Ongeveer een hele portie
❍ 2 tot 3 porties
❍ 4 tot 5 porties
❍ Meer dan 5 porties

In welke categorie viel (het merendeel van) de snoep / koekjes / tussendoortjes die zijn weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv heel pak koekjes)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv half pak koekjes)
❑ Etensresten: Resten die zijn overgebleven bij het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Chips / nootjes

Hoeveel chips / nootjes zijn in de afgelopen week weggegooid in uw huishouden? Een portie is een handvol chips of een handvol nootjes.

❍ Ongeveer een halve portie of minder
❍ Ongeveer een hele portie
❍ 2 tot 3 porties
❍ 4 tot 5 porties
❍ Meer dan 5 porties

In welke categorie viel (het merendeel van) de chips / nootjes die zijn weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Voedsel dat nog helemaal niet is gebruikt (bv hele zak chips)
❑ Deels gebruikt voedsel: Voedsel dat weggegooid wordt als het deels gebruikt is (bv halve zak chips)
❑ Etensresten: Resten die zijn overgebleven bij het eten
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Niet-alcoholische dranken (melk, sappen, frisdrank, hier valt NIET onder water/thee/koffie/siroop)

Hoeveel niet-alcoholische drank (melk, sappen, frisdrank, hier valt NIET onder water/thee/koffie/siroop) is in de afgelopen week weggegooid in uw huishouden?

❍ Minder dan een half glas
❍ Een half tot anderhalf glas
❍ Meerdere glazen (ongeveer een halve liter)
❍ Ongeveer een hele liter
❍ Meer dan een hele liter

In welke categorie viel (het merendeel van) de niet-alcoholische drank die is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Drank die nog helemaal niet is gebruikt (bv heel pak melk)
❑ Deels gebruikt voedsel: Drank die weggegooid wordt als het deels gebruikt is (bv half pak melk)
❑ Maaltijdresten: Drank die in het glas of beker is achtergebleven
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hi2eronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Alcoholische dranken

Hoeveel alcoholische drank is in de afgelopen week weggegooid in uw huishouden?

❍ Minder dan een half bierglas
❍ Een half tot anderhalf bierglas
❍ Meerdere bierglazen (ongeveer een halve liter)
❍ Ongeveer een hele liter
❍ Meer dan een hele liter

In welke categorie viel (het merendeel van) de alcoholische drank die is weggegooid? Kruis de categorie aan die het meest voorkwam. Als er meerdere categorieën evenveel voorkwamen, kunt u meerdere antwoorden aankruisen.

❑ Geheel ongebruikt voedsel: Drank die nog helemaal niet is gebruikt (bv hele fles wijn)
❑ Deels gebruikt voedsel: Drank die weggegooid wordt als het deels gebruikt is (bv halve fles wijn)
❑ Maaltijdresten: Drank die in het glas of beker is achtergebleven
❑ Restjes na bewaring: Restjes / kliekjes die weggegooid worden, nadat ze bewaard zijn geweest

Hieronder is ruimte om eventuele opmerkingen over deze vragen in te typen.

Hartelijk bedankt voor het invullen van deze vragenlijst. Mocht u nog opmerkingen hebben voor de onderzoekers, dan kunt u deze hieronder invullen.

9.3- Additional survey questions at the end of the study

Dit is de laatste vragenlijst uit dit onderzoek. Daarom willen we u ook een paar vragen stellen over hoe u het onderzoek in zijn geheel heeft ervaren. Dit gaat niet alleen over het invullen van deze vragenlijst, maar over het totale onderzoek, dus ook het thuis meten van voedselafval. In hoeverre bent u het eens met onderstaande stellingen? Verschuif de slider naar links of rechts om aan te geven in welke mate u het met de stelling eens bent.

_____ Het was gemakkelijk om het onderzoek uit te voeren
_____ Het onderzoek was best lastig om te doen
_____ Het onderzoek kostte veel tijd
_____ Het onderzoek kostte veel moeite
_____ De instructie waren duidelijk
_____ Ik twijfelde vaak bij het invullen van het onderzoek

Wij willen ook weten in hoeverre het meewerken aan het onderzoek uw kijk op voedselafval heeft veranderd. Geef weer aan in hoeverre u het eens bent met onderstaande stellingen.

_____ Ik ben me door het onderzoek meer bewust geworden van voedselverspilling
_____ Ik denk dat ik door het onderzoek mijn gedrag de afgelopen twee weken heb aangepast
_____ Ik ben van plan in de toekomst meer te letten op voedselafval

We weten uit eerder onderzoek dat al het voedselafval rapporteren in sommige gevallen moeilijk kan zijn, bijvoorbeeld als huisgenoten niet meewerken of als het veel moeite kost. We willen graag weten in hoeverre u dit zelf heeft ervaren. Geef weer aan in hoeverre u het eens bent met onderstaande stellingen.

_____ Er zijn in mijn huishouden vast wel voedingsmiddelen weggegooid zonder dat het gerapporteerd is
_____ Ik voelde soms de neiging om voedselafval niet te rapporteren in het onderzoek
_____ Het voedselafval in mijn huishouden is heel zorgvuldig gerapporteerd

Onderstaande vragen hoeft u alleen in te vullen als er in uw huishouden andere mensen zijn die voedsel weggooien, naast uzelf.

_____ Ik weet precies wat er door mijn huisgenoten in de afgelopen twee weken is weggegooid
_____ Mijn huisgenoten hebben goed meegewerkt aan dit onderzoek
_____ Mijn huisgenoten hebben hun voedselafval zorgvuldig genoteerd

Hartelijk bedankt voor het invullen van deze vragenlijst en voor uw medewerking aan dit onderzoek! Mocht u nog opmerkingen hebben voor de onderzoekers, dan kunt u deze hieronder invullen

# Annex 10 - Example page from diary (main study)

Geef per product het gewicht in grammen, in welke fase u het weggooit en in welke productcategorie het product valt. Als u iets niet in de afvalbak gooit maar b.v. iets aan huisdieren geeft, weeg dit dan eerst voordat u het aan uw huisdieren geeft. En vul in dat u het niet in de afvalbak gooit.

Datum	Gewicht (in gram)	Fase (nummer)	Categorie (nummer)	Heeft u dit in uw normale afvalbak gegooid? ja/nee	Indien nee graag aangeven wat de reden hiervan is
Maandag 13 juni					
Maandag 13 juni					
Maandag 13 juni					
Maandag 13 juni					
Maandag 13 juni					
Maandag 13 juni					
Maandag 13 juni					
Maandag 13 juni					
Maandag 13 juni					

Annex 11 - Placemat used for photographs (main study)
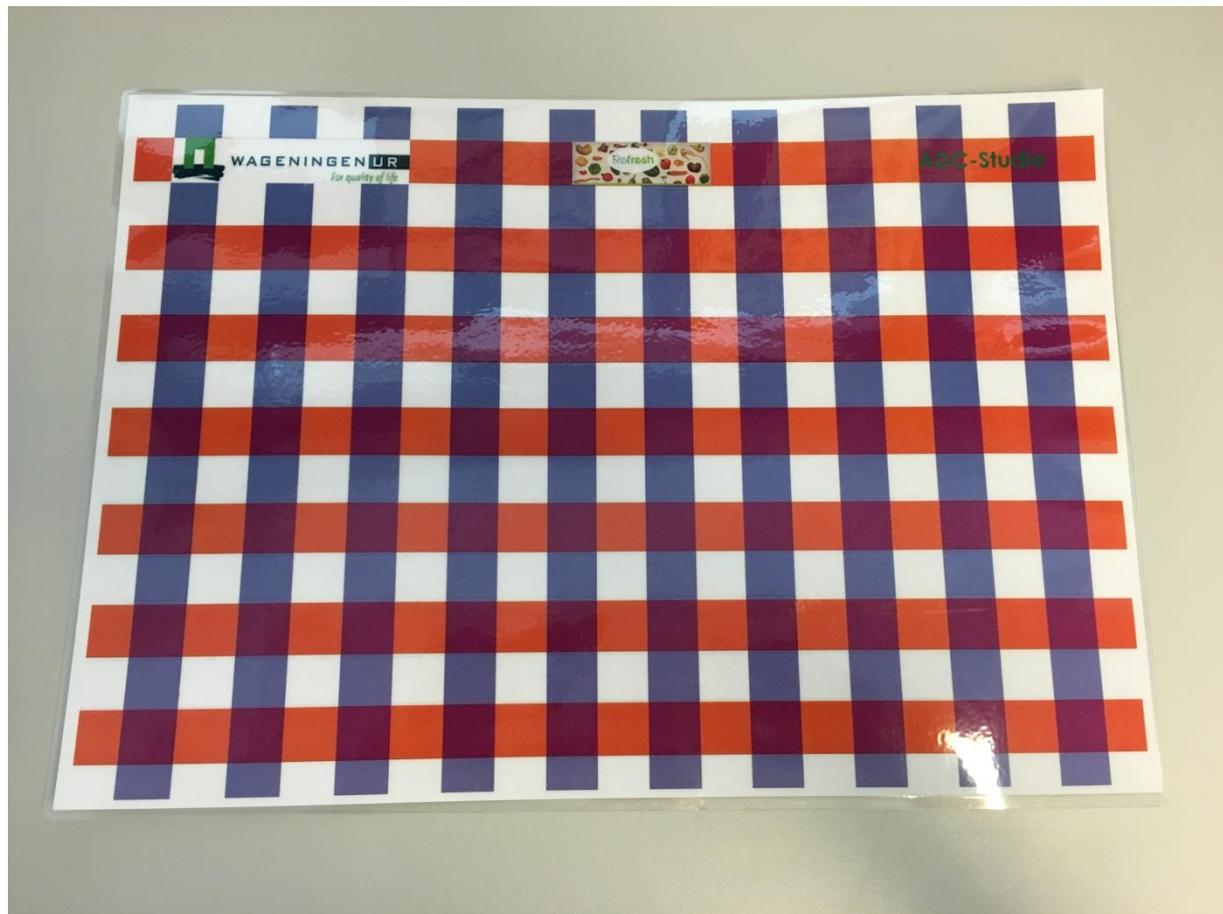
Annex 12 - Stickers used for kitchen caddies (main study)

Yellow sticker:

Red sticker:

Blue sticker:

Green sticker:

Annex 13 - Recalculation table for units into grams (main experiment)

Category	Unit	Grams	Reference
Fresh vegetables	Dishing spoon	50	Smakelijketenzonderzout.nl
Non-fresh vegetables	Dishing spoon	50	Smakelijketenzonderzout.nl
Fresh fruit	Piece	100	Smakelijketenzonderzout.nl and ah.nl
Non-fresh fruit	Piece	80	Ah.nl
Potatoes	Dishing spoon	60	Smakelijketenzonderzout.nl and ah.nl
Potato products	10 fries	50	Smakelijketenzonderzout.nl
Pasta	Dishing spoon	50	Voedingscentrum.nl
Rice	Dishing spoon	60	Voedingscentrum.nl
Meat	Portion	150	Ah.nl
Fish	Portion	150	Ah.nl
Sandwich filling	Portion	20	Ah.nl
Bread	Slice	35	Ah.nl and wijvallenaf.nl
Bread	Whole bread	800	Ah.nl
Cereals	Portion	40	Ah.nl
Cereals	Pack	500	Ah.nl
Yoghurt etc	Portion	150	Ah.nl
Yoghurt etc	Pack	1000	Ah.nl
Cheese	Cube	10	Ah.nl
Eggs	Egg	60	Favv.be and test-aankoop.be
Soups	Dishing spoon	150	Own measurement
Soups	Litre	1000	Ah.nl
Sauces	Spoon	20	Smakelijketenzonderzout.nl
Sauces	Bottle	450	Ah.nl
Candy	Portion	20	Wijvallenaf.nl
Chips / nuts	Portion	20	Wijvallenaf.nl
Non-alcoholic beverage	Glass	250	Zelfmaakrecepten.nl
Non-alcoholic beverage	Litre	1000	Ah.nl
Alcoholic beverage	Beer glass	300	Ah.nl
Alcoholic beverage	Litre	1000	Ah.nl