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MISS CLAUDIA GIORDANO (Orcid ID : 0000-0003-4117-5918)

DR. CLARA CICATIELLO (Orcid ID : 0000-0002-3299-5001)

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**Title**

Do discounted food products end up in the bin? An investigation into the link between deal-prone shopping behaviour and quantities of household food waste.

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*Authors: Claudia Giordano<sup>1\*</sup>, Fabrizio Alboni<sup>2</sup>, Clara Cicatiello<sup>3</sup>, Luca Falasconi<sup>4</sup>*

<sup>1</sup> Department of Agricultural and Food Sciences, University of Bologna, Via Fanin 50, 40127, Bologna, Italy

<sup>2</sup> Department of Statistics, Università di Bologna, via delle Belle Arti 40100 Bologna

<sup>3</sup> Department of Innovation in Biological Systems, Food and Agroforestry, University of Tuscia, Via San Camillo de Lellis snc, 01100, Viterbo, Italy

<sup>4</sup> Department of Agricultural and Food Sciences, University of Bologna, Via Fanin 50, 40127, Bologna, Italy

\* Corresponding author: claudia.giordano4@unibo.it; Tel. +39 051 2096144, Department of Agricultural and Food Sciences, University of Bologna, Via Fanin 50, 40127, Bologna, Italy

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## **Abstract**

Household Food Waste is considered to be the largest share of food waste along the food supply chain. Given that its recoverability is also more challenging compared to food waste in other stages of the chain, most studies on household food waste adopt a pre-emptive approach by aiming to identify and address consumer beliefs, attitudes and actions that are linked to food waste. In scientific literature, household food waste has often been studied in relation to the habit of purchasing discounted food products (DFP). However, findings have been contradictory. Specifically, while some authors found that deal-prone consumers are usually of lower income and therefore display a wiser and more attentive attitude toward grocery shopping, other authors reported that the purchase of discounted products was usually linked to compulsive shopping, hence resulting in higher food waste quantities at home. Due to these discrepant findings, a definitive answer on the impact of DFP on household food waste does not currently exist in the literature. This paper analyses the correlation between the purchase of discounted food products and weekly household food waste quantities. To do so, we examine (i) the results of a food waste diary experiment carried out on a representative sample of 385 households in Italy in February 2017, and (ii) the results of a 23-items CAWI survey administered to the same householders, in which shopping habits were investigated. Results revealed no evidence of either a positive or negative relationship between the purchase of discounted food products and household food waste quantities. Frequency of grocery shopping was the only variable found to have a significant impact on household food waste quantities.

## **Keywords**

Food deals, shopping behaviour, household food waste, food diary, CAWI

## Introduction

Several studies have been conducted on household behaviour in relation to food waste.

A selective search through the Scopus database using the keywords “food waste” AND “household” OR “consumer” AND “behaviour”, and excluding the disciplines of medicine and nursing, resulted in 416 journal articles published from 2010 onward. Several consumer-related variables such as motivation to avoid food waste (Aschemann- Witzel, 2015), family characteristics (Abeliotis et al., 2014; Koivupuro et al., 2012), income (Setti et al., 2016) and others (Parizeau et al., 2014; Neff et al., 2015; Raquel. et al., 2015; Gaiani et al., 2017) were explored in these articles. Most of the studies were conducted through the use of questionnaires, although more analytical methods such as quasi-ethnographic studies (Farr-Wharton, 2014) were sometimes applied. Results on the relationship between socio-demographic variables and household food waste quantities were generally inconsistent across the articles, although the following findings were recurrent: a strict negative correlation between age and food waste (as reported, for instance, by Melbye et al., 2017), a positive correlation between size of household and the total food waste produced, but a higher per capita food waste observed in single households (Koivupuro et al., 2012; WRAP, 2014; Baker et al., 2009; Gaiani et al., 2017).

It is widely accepted that household food waste represents the largest share of food waste produced across the food supply chain (Monier et al., 2010; FAO, 2011; Stenmarck & Östergren, 2015), and that its recoverability is much lower when compared to waste in other stages of the chain (Garrone et al., 2014). Therefore, at the household level, prevention is regarded as the most effective strategy for reducing food waste. Studying the causes of food waste at home is crucial for the design of effective interventions that reflect this preventative approach, such as awareness-raising campaigns and food-related educational resources.

For the above reason, researchers have begun exploring the issue of food waste from the household perspective, and one of the common subjects of investigation surrounds whether or not the availability of discounted food products in stores may push consumers to purchase beyond their needs, possibly resulting in higher food waste quantities at home. Some studies have detailed how manufacturers increasingly pushed more food products at consumers, who promptly responded by buying—and wasting—more (Packard, 1962; Cox and Downing 2007; Farr-Wharton et al., 2014; Graham-Rowe et al., 2014; Mondéjar-Jiménez et al., 2016; Porpino et al., 2015; Ramukhwatho et al., 2018,

Schanesa et al. 2018). Contrarily, studies conducted by Koivupuro et al. (2012), Jörissen et al., (2015) and Aschemann-Witzel et al. (2017) revealed that the purchase of suboptimal food products at a discounted price was associated with lower quantities of food waste at home. In a very recent paper, Le Borgne et al. stated the following: “*Finally, if consumers buy products on promotion that they finally do not consume, they may experience post-purchase dissonance and increased future perceived probability of waste*”. The authors concluded that a higher perceived probability of waste increased a consumer’s likelihood to purchase discounted food products, and they recommended that future studies explore this possibility.

While the study by Koivupuro et al. (2012) applied a combination of the diary method and the questionnaire method, the study by Aschemann-Witzel et al. (2017) was based on 16 in-depth interviews and a panel of 848 consumers surveyed through Computer Assisted Web Interview (CAWI)/Computer Assisted Telephone Interview (CATI) survey techniques. It must be noted that results based on these self-assessment methods have been found to be less reliable compared to those based on quantification of waste through direct measurement. However, given the heavy human and financial resources required to apply direct measurement methodologies such as waste sorting analysis, the present study adopts the combined methodology implemented by Koivupuro et al. (2012).

## **Methods**

### *Objectives and study design*

In this study, we assess the possible relationship between consumer attitudes towards purchase of discounted food products, investigated through a CAWI survey, and the quantities of household food waste produced by the same consumers over the course of a week, as documented in a diary survey. The aim of the study is to test for the existence of a correlation between the purchase of discounted food products and quantities of household food waste. By discounted food products (DFP from this point forward), we refer to either 30-50% discounts on products approaching their expiration date or “two for one” offers.

## Definitions

As a result of the combined methodology (diary survey and CAWI survey questionnaire) adopted in the present study, the final set of data includes information on the quantity and type of household food waste, as well as information on participants' food-related attitudes and shopping behaviour. The manner in which the above information was collected was consistent with the definition of food waste provided by FUSIONS (a research project whose definition may be adopted by the EC) as well as that provided by Waste and Resource Action Program (which operates under the acronym of "WRAP"), an environmental agency in charge of reducing food waste and its impacts in the UK by 2025. According to FUSIONS, food waste is defined as "*any food, and inedible parts of food, removed from the food supply chain to be recovered or disposed (including composted, crops ploughed in/not harvested, anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)*" (;). WRAP considers food waste as a combination of the following (WRAP, 2013).

- ✓ *Avoidable* food waste, i.e. food and drink thrown away because they are no longer wanted, for instance because they perished or exceeded their expiration date. Most avoidable losses are composed of material that was, at some point prior to the disposal, edible, even though a proportion is not edible at the time of disposal due to deterioration (e.g. rotting, decomposition).
- ✓ *Possibly avoidable* food waste, i.e. food and drink that some people eat and others do not (e.g. apple peels), or that can be eaten when prepared in one way but not in another (e.g. potato or pumpkin skins), or that is sorted out due to specific quality criteria (e.g. bent carrots).
- ✓ *Unavoidable* food waste, including waste arising from food and drink preparation that is not, and has not been, edible under normal circumstances. This includes apple cores, banana skin, tea leaves, coffee grounds, meat bones etc.

Only the edible fraction of food waste was considered in the present study, i.e. food waste comprised of *avoidable* and *possibly avoidable* food waste, as per WRAP's definition (fig.1).



Food thrown away during the week and during the clearing of the fridge and pantry at the end of the week were the two recorded components of household food waste.

### *Sampling and privacy*

A stratified random sampling was employed in the selection of participants. The diary survey and the Computer Assisted Web Interview (CAWI) were administered to a sample of 400 households representative of the entire Italian population in terms of geographical area of residence (North, Centre or South of Italy), population of city of residence (above or under 100,000 inhabitants), and household composition (households without children, households with children aged less than 11 years old, or households with children aged between 11 and 17 years old).

The diary survey was conducted over a week in February 2017. Two weeks later, the same households were asked to respond to a questionnaire, through a CAWI software that included specific questions on shopping behaviour and food-related attitudes. The overall experiment was preceded by both a pre-test and a pilot test conducted in 2015, respectively needed to test the tools (pre-test) and the overall procedure with regard to drop out rates, optimum incentives, and the reliability of the diary method at estimating food waste quantities when compared to the waste sorting method (pilot test).

Of the 430 diaries collected on household food waste, 42 were deemed invalid due to incomplete information, while 3 participants responded “I don’t remember” to the preliminary screening question and thus were not included in the analysis. The results reported in this paper are, therefore, based on 385 households.

Respondents remained anonymous during the diary experiment. They were also compensated, given that the experiment was expected to be time-consuming.

### *Structure of the diary and the questionnaire*

Household members who were responsible for shopping and food management in the participating households were required to record the quantity of food waste produced within the household on a daily basis, including key details on food thrown away.



Following the diary developed by the National Agency for Italian Statistics to inquire into household consumption habits, respondents were asked to fill out a diary over the course of one week, reporting the following: (i) details on grocery shopping (ii) quantity of household food waste per day and per meal (by weighing leftovers), (iii) unusual circumstances that may have affected routine habits related to food consumption, and (iv) details of a final clearing out of the fridge and pantry at the end of the week to remove food bought during the week but not consumed and no longer intended to be consumed.

The diary format and questionnaire were based on previous experiments conducted in Italy with smaller samples as well as on existing diary studies conducted by WRAP (WRAP, 2012 and 2013) and Koivupuro (Koivupuro, 2015).

In the diary, respondents were asked to complete three open-ended questions on the following:

*[Open ended questions]*

1. What did you throw away? (Products and their brand names, where possible)
2. Why did you throw it away?
3. How much of it did you throw away? (Direct measurement recommended using a weight scale or alternative estimation tools provided in the instructions.)

In addition, respondents were asked to select a single response to multiple choice questions on the following:

*[Multiple-choice questions]*

1. Manner of disposal (mixed garbage, organic waste, sewer, given to pets, or other).
2. Type of product (frozen, tinned, fresh, takeaway, or home-made).

Meals consumed away from home during the week (e.g. in canteens, restaurants etc.) were not included in the diary, while meals purchased outside of home and then consumed at home were. The latter includes takeaway meals consumed at home.

The diaries were designed in paper format and were delivered to respondents by field collectors from SWG (a marketing and survey company). The collectors were also responsible for explaining instructions regarding the diary to household members in charge of filling them out; calling in mid-week to assess the status on diary completion; and, finally, collecting the diaries at the end of the week and sending them to the researchers via regular mail.

Two weeks after completion of the diary experiment, the participating households were sent a 23-item questionnaire by email that included questions on grocery shopping and food storage habits, as well as questions on personal beliefs regarding food waste and the environment.

### *Data analysis*

Data entry of the information recorded in the diaries was performed between June and September 2017 using a Limesurvey mask, while statistical analysis was performed using R software.

In order to respond to the research question, we developed a methodology for analysing the data collected through the diary experiment and the CAWI questionnaire. From the quantity of food waste reported in each household's diary, we extracted the quantity of *edible* food waste, comprised of *avoidable* and *possibly avoidable* food waste. Hence, we arrived at a value representing edible food waste produced by each household in one week. In this step, waste was also classified into food categories such as fruits, vegetables, etc. First, we estimated the per capita average weekly amount of edible food waste, based on the number of members in each household. Then, for each household, we recorded attitudes towards the purchase of discounted food products, based on the following two questions in the CAWI survey: “*Do you buy discounted food products (‘Two for one’ or ‘30-50% off’)?*” (Question 13), and “*In the past three weeks, how often did you buy DPF that was later thrown away?*” (Question 14a). Note that the second question makes reference to the week of the diary experiment along with the subsequent two weeks. Thus, for each household we analysed the responses provided to the other six items of the CAWI survey, which dealt with additional shopping behaviour including frequency, location, and method of shopping. Finally, we compared the per capita average weekly amount of food waste across household attitudes towards DFP and reported shopping behaviour using ANOVA and T tests. Reasons for food waste and food product type were also considered in the analysis.

## **Results**

### *Average per capita food waste*

The quantity of edible food waste reported in the diary study amounted to 530g per capita per week on average, with a value of 1,224g per week per household. The edible fraction accounted for 60% of the total waste reported in the diaries. Vegetables were the most wasted food items (25% of the total edible fraction),

followed by milk (17.6%) and then fruits (15.6%)<sup>1</sup>. Nearly half (46%) of the entire edible fraction was thrown away due to spoilage.

#### *Attitude towards Discounted Food Products*

231 households (60%) stated that they purchased DFP; they are referred to as sub-sample A from here onward. The other 154 households stated that they do not purchase DFP, and they are referred to as sub-sample B.

An X-squared test was performed to test for the existence of a relationship between the purchase of DFP and size of household (Table 1) or presence of children (Table 2). The results of the test indicated a significant relationship between the purchase of DFP and size of household ( $p$ -value=0.0182), while no relationship was found between the purchase of DFP and the presence of children ( $p$ -value=0.1332).

#### *Purchase of DFP and weekly quantities of household food waste*

In the week of the diary experiment, we recorded 530g of per capita edible food waste for the entire sample. A slight difference in weekly per capita food waste was observed between sub-sample A and sub-sample B [Table 3].

While sub-sample A displayed an average waste of 489g per capita in one week, sub-sample B displayed an average waste of 593g. However, this difference was not found to be significant (Wilcoxon test  $p$ -value = 0.4). The distribution within the two sub-groups is reported in Figure 2.

#### *Correlation between purchase of DFP and household per capita food waste*

Two weeks after the conclusion of the diary experiment, respondents belonging to sub-sample A - who had previously confirmed that they purchased DFP - were asked the following question: “*In the past three weeks, how often did you buy DFP that was later thrown away?*”. Table 4 outlines the responses, with most respondents stating that it had happened “*sometimes*” or “*never*”.

It is interesting to note that respondents who stated that they did not purchase DFP actually recorded a higher quantity of waste (764g per capita per week on average) (Table 5) compared to respondents who stated that they had often thrown away DFP during the past three weeks (447g per capita per week on average). [Figure 3]

A pairwise comparison among groups [Table 6] revealed that respondents, who declared to have always thrown away products purchased in a special offer, produced significantly higher quantities of food waste compared to other groups.

#### *Type of products wasted and DFP purchase*

In Table 7, the different categories of food and their associated quantities of per capita edible food waste are listed. Of the average per capita food waste of the overall sample (530g), 26% was comprised of vegetables, 19% of fruit, 15.6% of milk, and 12% of baked goods.

The Wilcoxon-Mann-Whitney test was used to compare the quantity of food waste reported by sub-sample A and that reported by sub-sample B, with an aim to investigate whether or not the purchase of DFP could affect the quantity of food thrown away at home. Results revealed no significant differences in food waste quantities between respondents who regularly purchased DFP and those who did not. The same result was confirmed about the most wasted food product types. For example, the 130g of vegetables per capita per week wasted on average by sub-sample A was lower than but not significantly different from the 145g wasted by sub-sample B (p- value = 0.9925).

#### *Reasons for food waste and DFP purchase*

Table 8 lists the reasons for food waste as reported by the two sub-samples. The most frequently stated reason for food waste was “spoiled”. This reason accounted for 251g of food waste per person per week on average when the overall sample was considered. The second most frequently stated reason for food waste was “personal preferences” (in other words: *I don't like it*), which accounted for an average of 138g of food waste per person per week. “Cooked/served too much” was the third most frequently stated reason, corresponding to an average of 99g of food waste per person per week.

Possible differences between sub-sample A and sub-sample B with respect to reasons for food waste were tested for, but no significant differences were detected (p- value: 0.3- 0.7).

### *The role of shopping behaviour*

Regarding shopping behaviour, we asked respondents for details on frequency of grocery shopping, the type of shops that were visited (supermarket, local shop, etc), and whether or not grocery shopping was organized (i.e. whether or not a list was used).

The purpose of these questions was to assess whether or not other aspects of shopping behaviour could influence the amount of food waste produced at home. More specifically, we investigated whether any of these aspects of shopping behaviour could influence the relationship between the purchase of DFP and quantities of household food waste (Table 9). The distribution of responses is illustrated in Figure 4.

#### *Location of grocery shopping*

Looking at the graph in Figure 4, it can be deduced that there were no substantial differences in quantities of food waste based on location of shopping (Kruskal-Wallis (1952) chi-squared = 4.2302, df = 2, p-value = 0.1206). Location of shopping was also found to have no significant influence on the relationship between the purchase of DFP and quantities of household food waste.

#### *Frequency of grocery shopping*

Frequency of shopping was found to have a significant impact on quantities of household food waste (Table 10). Specifically, households that shopped less frequently exhibited a significantly higher level of food waste compared to households that shopped more frequently (Kruskal-Wallis chi-squared = 16.487, df = 3, p-value = 0.0009008). The distribution of responses is shown in Figure 5. Frequency of shopping was, however, found to have no significant influence on the relationship between the purchase of DFP and quantities of household food waste.

#### *Organization of grocery shopping*

With regard to method of shopping, i.e. the presence or absence of a shopping list (Table 11), the distribution of responses is reported in Figure 6. No significant differences in food waste quantities were found based on this

variable (Kruskal-Wallis chi-squared = 4.3932, df = 4, p-value = 0.3554). However, method of shopping was found to have a significant impact on the relationship between the purchase of DFP and quantities of food waste. Specifically, households in sub-sample A who stated that they had a clear list in mind while shopping wasted significantly less food compared to households in sub-sample B that stated the same (p-value = 0.03).

## **Discussion and conclusions**

The quantity of household food waste calculated in this study is not consistent with the values reported in previous studies. In Italy, household food waste has been estimated solely through the use of questionnaires, which require a reliance on self-assessment by respondents. Quantities of household food waste estimated through this method fell within the range of 300g - 600g per household per week ;. In the present study, the quantity of household food waste calculated amounted to 0.530 kg per person per week (27.5 kg per person per year) and 1.224 kg per household per week. This result is more consistent with Koivupuro's findings, in which an estimate of 23kg of food waste per person per year was derived. Some other direct measurement studies reported even higher estimates of waste, such as 70kg per person in the UK (WRAP, 2013). However, it is important to note that despite the diary method's status as the best methodology for arriving at both qualitative and quantitative results in the same study, the method still has some important limitations. One of these is the possible underestimation of food waste by respondents due to social desirability bias and other factors. This underestimation has previously been calculated to be between 20 and 40 percent (Quested et al. 2013 and Giordano, 2016), and although it is much lower than the underestimation calculated for questionnaires, it still is enough to warrant a recommendation that future studies include the use of more bias-free quantification methods such as waste compositional analysis.

Contradictory to our initial expectations, no statistically significant differences in food waste were detected between households who purchased DFP and those who did not. Therefore, the answer to our initial question "Do special offers increase quantities of food waste at home?" seems to be negative. This finding is consistent with the comments by Aschemann-Witzel et al. (2017), who stated that deal-prone customers are not by definition more likely to waste food at home compared to other consumers. By contrast, the finding is inconsistent with Cox and Downing's (2007) suggestion that food product sales may lead to increased waste. However, the results of these authors were based on respondents' self-assessment of household food waste, while the present study adopted a more objective and precise approach to the quantification of household food waste.



An interesting finding was the existence of a significant relationship (at a level of 5%) between the purchase of DFP and household size, with households of 2 or more members being more likely to purchase DFP.

Surprisingly, it appeared that some respondents actually had good awareness of how much food they wasted, particularly those who purchased DFP but did not use them up on time. Specifically, those who stated that they “threw away DFP always/often during the past three weeks” exhibited a weekly average per capita food waste of 764g, significantly higher than the average per capita value observed for those who selected a more neutral response to the question, which was 489g.

With respect to other shopping behaviour, frequency of shopping was found to be a determinant of food waste, with households who went grocery shopping “once a month” displaying food waste of 835g per capita per week on average. However, only 15 households selected that option. A majority of households (218) selected the option “more than once a week” and displayed food waste of 520g per capita per week on average. This difference was statistically significant, although no significant differences were observed between sub-sample A and B for this variable.

A significant difference in quantities of food waste was also observed between households who used a shopping list and those who did not. Specifically, among the 75 households that selected the option “I had a clear list in my mind before shopping”, households in sub-sample A wasted 460g of food on average, while households in sub-sample B wasted 731g on average in the same period. Hence, it appears that a) households who went grocery shopping b) with a clear mental or physical list of items to purchase and c) who did not purchase DFP, wasted higher quantities of food. If purchase of DFP is considered to be a proxy for the economic situation of a household, we could then assume that, taking two consumers that adopt the same strategical approach to grocery shopping (having a clear list in mind), the consumer who pays more attention to price (by purchasing DFP if available) will waste less food than the one who does not. However, this assumption needs to be explored further by future studies, ideally studies in which the salary of the household is clearly stated and the data is reliable.

In sum, frequency of shopping was the only variable that seemed to influence quantities of household food waste, while the purchase of DFP was only a determinant of food waste quantities when tied to the context of shopping with or without a clear shopping list. Additionally, households composed of 2 or more members were more likely to purchase DFP compared to single households.



To conclude, the present study found no evidence of a correlation between the purchase of DFP and quantities of household food waste. This finding contradicts those reported by Cox and Downing (2007), Aschemann-Witzel et al. (2017), and Koivupuro et al. (2012), while it is more in line with findings outlined by Moraud as well as comments made by Evans on the nature of the public debate on food waste, which the author suggested to be too focused on the behaviour and “faults” of consumers while ignoring the complexity of the system behind the issue. Qualitative studies such as participant observation, despite being less cost-effective for large-scale samples, may be better able to provide new information on how best to intercept the causes of food waste at home.

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| Number of components per family | Buy DFP (share) |            | Total      |
|---------------------------------|-----------------|------------|------------|
|                                 | Yes (A)         | No (B)     |            |
| 1                               | 21              | 31         | 52         |
| 2                               | 106             | 64         | 170        |
| 3                               | 55              | 34         | 89         |
| 4 +                             | 49              | 25         | 74         |
| <b>Total</b>                    | <b>231</b>      | <b>154</b> | <b>385</b> |

**Table 1- Number of components of the families who declare to buy DFP (sub-sample A) and families who do not (sub-sample B)**

| Type of family | Buy DFP (share) |            | Total      |
|----------------|-----------------|------------|------------|
|                | Yes (A)         | No (B)     |            |
| With children  | 89              | 47         | 136        |
| No children    | 142             | 107        | 249        |
| <b>Total</b>   | <b>231</b>      | <b>154</b> | <b>385</b> |

**Table 2: Families who declare to buy DFP (sub-sample A) and families who do not (sub-sample B). Presence of children**

| Buy DFP      | Average (in grams) | Median     | St.Dev.    |
|--------------|--------------------|------------|------------|
| Yes          | 489                | 395        | 403        |
| No           | 593                | 396        | 556        |
| <b>Total</b> | <b>530</b>         | <b>395</b> | <b>472</b> |

**Table 3 Average per capita Food Waste, two sub-sample**

|                | DFP bought (percentage) |              |       |
|----------------|-------------------------|--------------|-------|
|                | Sub-sample A            | Sub-sample B | Total |
| Always         | 8.7                     | 0            | 5.2   |
| Often          | 21.2                    | 0            | 12.7  |
| Sometimes      | 36.4                    | 0            | 21.8  |
| Never          | 32.9                    | 100          | 59.7  |
| Don't remember | 0.9                     | 0            | 0.5   |
| Total          | 100                     | 100          | 100   |

Table 4: Thinking to the last three weeks, how often you bought DPF that was thrown away lately? (Question 14a) (N=231)

|           | Nr of respondents | Col % | Per capita FW (grams) |         |        |
|-----------|-------------------|-------|-----------------------|---------|--------|
|           |                   |       | Mean                  | st.Dev. | Median |
| Always    | 20                | 8.7   | 763.7                 | 517.1   | 667.8  |
| Often     | 49                | 21.4  | 446.5                 | 357.7   | 340.0  |
| Sometimes | 84                | 36.7  | 457.8                 | 341.5   | 398.8  |
| Never     | 76                | 33.2  | 478.8                 | 442.8   | 381.0  |
| Total     | 229               | 100   | 489.1                 | 404.5   | 394.5  |

Table 5-Average Per capita FW, with reference to single answer. (Question 14 a) Sub-sample A

| p-value   | Always | Often | Sometimes |
|-----------|--------|-------|-----------|
| Often     | 0.032  |       |           |
| Sometimes | 0.048  | 1.000 |           |
| Never     | 0.036  | 1.000 | 1.000     |

Table 6: Pairwise comparisons using Dunn's-test for multiple comparisons of independent samples. P value adjustment method: Bonferroni

|               | FW quantities (grams) |              |       | % on the total |
|---------------|-----------------------|--------------|-------|----------------|
|               | Sub-sample A          | Sub-sample B | Total |                |
| Vegetables    | 129.8                 | 145.3        | 136.0 | 25.6           |
| Fruit         | 81.5                  | 90.0         | 84.9  | 16.0           |
| Meat          | 29.4                  | 42.8         | 34.8  | 6.6            |
| Fish          | 7.3                   | 11.5         | 9.0   | 1.7            |
| Eggs          | 4.9                   | 6.8          | 5.6   | 1.1            |
| Pasta         | 38.1                  | 43.0         | 40.0  | 7.6            |
| Legumes       | 9.4                   | 9.3          | 9.3   | 1.8            |
| Bakery        | 56.4                  | 69.0         | 61.5  | 11.6           |
| Milk & cheese | 83.9                  | 105.9        | 92.7  | 17.5           |
| Cakes         | 4.5                   | 6.1          | 5.1   | 1.0            |
| Drinks        | 17.2                  | 27.4         | 21.3  | 4.0            |
| Seasoning     | 11.2                  | 18.6         | 14.2  | 2.7            |
| Snack         | 8.9                   | 8.5          | 8.7   | 1.6            |
| Other FP      | 6.1                   | 8.6          | 7.1   | 1.3            |
| Total         | 488.6                 | 592.9        | 530.3 | 100.0          |

Table 7- Average Food Waste per capita, expressed in grams, per product

|                      | DFP bought (in grams) |       |       | %     |
|----------------------|-----------------------|-------|-------|-------|
|                      | Yes (A)               | No(B) | Total |       |
| Spoiled              | 228.8                 | 285.0 | 251.3 | 47.4  |
| Too much             | 82.7                  | 122.2 | 98.5  | 18.6  |
| Personal preferences | 132.3                 | 145.5 | 137.6 | 25.9  |
| Mistake (shopping)   | 1.5                   | 2.0   | 1.7   | 0.3   |
| Accidental           | 9.8                   | 7.9   | 9.0   | 1.7   |
| Children             | 20.3                  | 20.2  | 20.3  | 3.8   |
| Other                | 13.4                  | 10.1  | 12.0  | 2.3   |
| Total                | 488.6                 | 592.9 | 530.3 | 100.0 |

Table 8- Causes of food waste in both the sub-groups, grams

|   | Nr. of families | Col % | Buy DFP | NOT buy DFP | Total |
|---|-----------------|-------|---------|-------------|-------|
| I buy almost all my food in a main shop (for instance, supermarket) | 123             | 31.9  | 514.2   | 535.5       | 522.7 |
| I buy some food in a main shopping trip and some in local shops     | 229             | 59.5  | 489.1   | 622.1       | 540.2 |
| I mostly buy food in smaller local shops                            | 33              | 8.6   | 366.0   | 607.0       | 490.2 |
| Total   | 385             | 100   | 488.6   | 592.9       | 530.3 |

Table 9- Q4: Which of these statements best describes your food shopping habits?

|   | Nr. of families | Col %       | Waste in grams (Sub-sample A) | Waste in grams (Sub-sample B) | Waste in grams Total |
|---|-----------------|-------------|-------------------------------|-------------------------------|----------------------|
| <b>I do a main shop more than once a week</b> | <b>218</b>      | <b>56.6</b> | <b>478.5</b>                  | <b>585.5</b>                  | <b>520.2</b>         |
| I do a main shop about once a week            | 124             | 32.2        | 444.2                         | 484.2                         | 460.4                |
| I do a main shop about once a fortnight       | 28              | 7.3         | 689.7                         | 843.2                         | 755.5                |
| <b>I do a main shop about once a month</b>    | <b>15</b>       | <b>3.9</b>  | <b>665.1</b>                  | <b>1029.1</b>                 | <b>834.9</b>         |
| Sum   | 385             | 100         | 488.6                         | 592.9                         | 530.3                |

Table 10- Q5: Which of the following statements best describes your food shopping habits?

|   | Nr. of families | Col %        | Sub-sample A | Sub-sample B | Total        |
|---|-----------------|--------------|--------------|--------------|--------------|
| I kept a "running list" during the week of things I needed to buy | 78              | 20.26        | 536.9        | 433.7        | 503.8        |
| I made a list before to go to the shop                            | 127             | 32.99        | 454.4        | 472.0        | 460.1        |
| <b>I had a very clear list in my head</b>                         | <b>75</b>       | <b>19.48</b> | <b>460.8</b> | <b>731.0</b> | <b>594.1</b> |
| I had some idea of the kind of things I wanted to buy             | 89              | 23.12        | 498.8        | 575.4        | 534.1        |
| None of the above   | 16              | 4.16         | 647.4        | 1046.9       | 897.1        |
| Total   | 385             | 100          | 488.6        | 592.9        | 530.3        |

Table 11-Q9: Thinking about the last time you did a main grocery shop, which of these describe what you did beforehand?



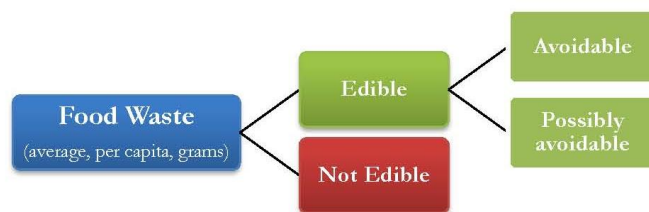


Figure 1- Definition of food waste applied in this study (adapted from WRAP, 2013)

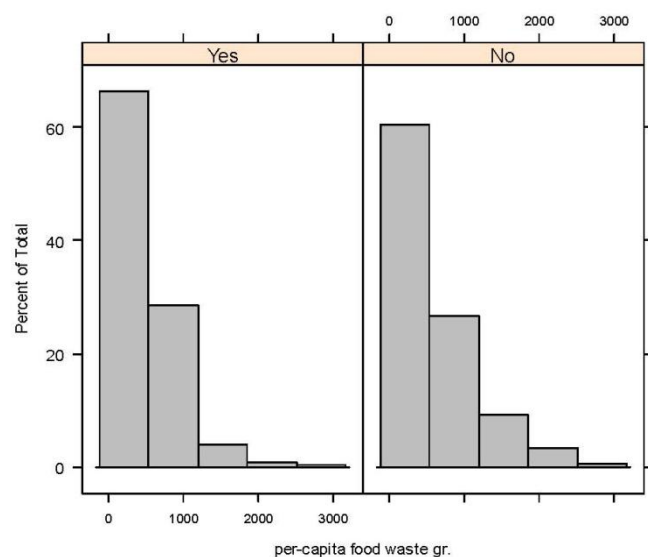


Figure 2: Distribution of per capita food waste, per sub-sample

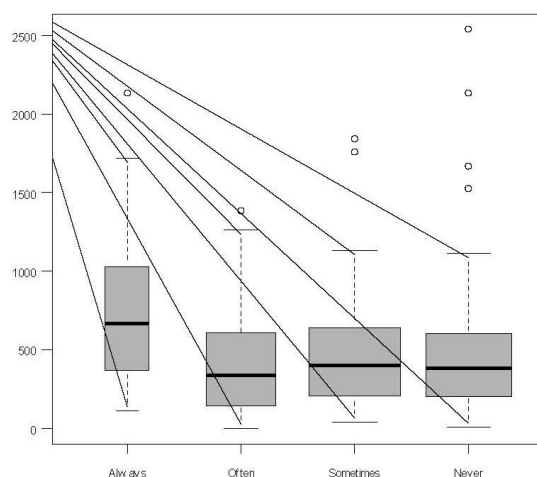


Fig. 3 Average/per capita/ FW sub-sample A, question 14a. Split per answer. Quartiles

Fig. 4- Distribution of answers with reference to the place for shopping

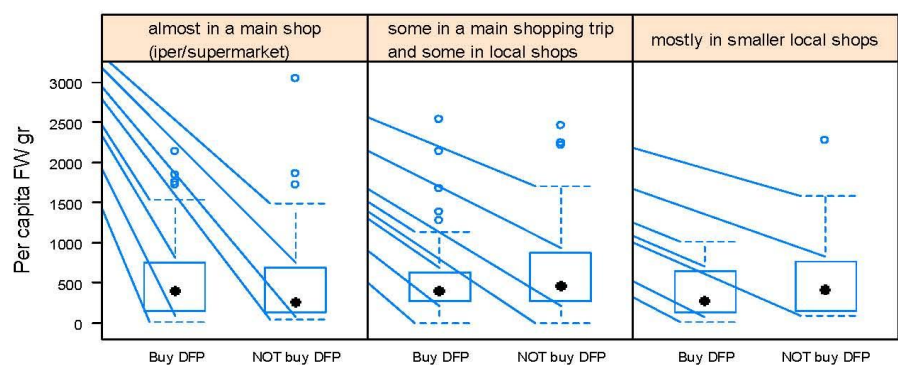


Fig. 5- Distribution of answer for frequency of shopping

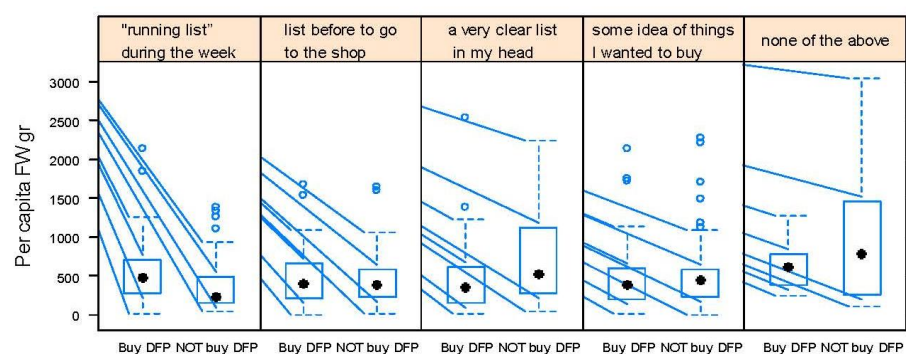
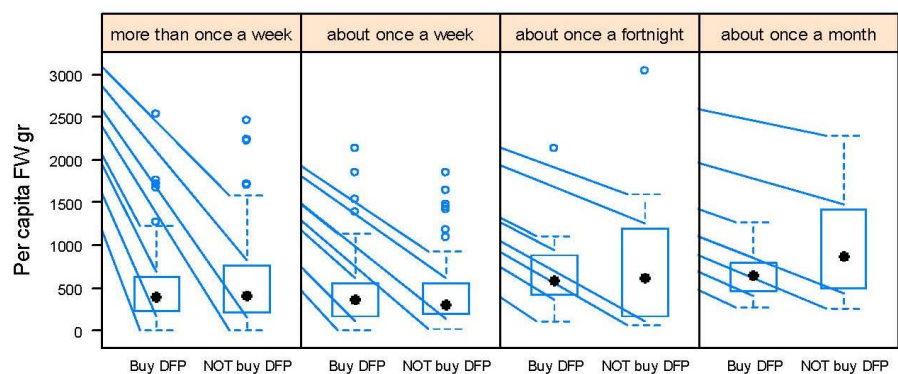


Figure 6: Distribution of answer for the shopping organization

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