Wash and Waste?
The Case of Unwashed Potatoes in Germany

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Jan Philipp Paeslack[*] and <u>Daniel Cracau</u>[†]

Abstract: In the recent food waste debate, potatoes represent an important factor with approximately half of the production being removed from the food supply chain. Because selling unwashed potatoes is known as a potential remedy to address this phenomenon, the present article investigates this case in detail. Focusing on the consumer perspective, a survey with a total of 307 participants has been conducted in Germany. The results reveal that information on the underlying benefits may positively influence consumers' attitude towards unwashed potatoes. Positive attitudes towards the environment, suboptimal products in general and food loss avoidance significantly drive consumers' willingness to buy unwashed potatoes; the main factor for reluctance is the perceived inconvenience regarding preparation. Finally, a gender effect is observed with a discount being more effective for male consumers.

1 Introduction

Food waste is a major challenge for societies worldwide. According to the most recent data from the Food and Agriculture Organization, around one third of the food produced is lost globally (FAO, 2013). During the last decades, the amount of food waste per capita increased and this trend is projected to even continue (Alamar et al., 2018). This stands in sharp contrast to the global ambition to "halve per capita global food waste" by 2030, as expressed in the UN Sustainable Development Goal (SDG) 12, target 3. Among the reasons to reduce food loss are environmental, social and economic drivers (Lipinski et al., 2013; Thyberg and Tonjes, 2016). Surplus production is often used for biogas generation or animal feed, is plowed back into the fields or goes to landfill. However, preventing surplus from accruing is regarded as the most promising option to increase sustainability (Papargyropoulou et al., 2014; Mourad, 2016).

In industrialized countries, retailers nowadays offer an increasingly wide range of products and consumers are able to choose what best fits their needs. On the one hand, it might appear rational to assume that consumers prefer *normally* shaped food over a wonky fruit or vegetable and thus, retailers react by adapting their offerings. Beretta et al. (2013) report that food loss because of product standards or cosmetic specifications is one of the most important causes of food waste. On the other hand, an opposite trend towards "naturalness" among consumers can be observed. At least partially, this has led to a growing number of retailers offering products like vegetables without packaging, for example *Rema1000* in Denmark or *denn's Biomarkt* in Germany. This also allows consumers to purchase different sizes and additionally reduces food waste. While the recent discussion on the complex

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tradeoff to reduce food waste is vast, a sufficient data pool for research on food losses is still missing (Xue et al., 2017).

Potatoes provide a special case both in the food supply chain and in the literature. While until the last few decades they had been sold unwashed, the majority of potatoes are currently sold washed (Keiser et al., 2012). It seems even to be the case that mainstream retailers do not offer unwashed potatoes, due to a reluctance to sell suboptimal products (Hermsdorf et al., 2017). However, Willersinn et al. (2017b) have shown that the sale of unwashed potatoes has a promising loss reduction potential, rendering it a reasonable element within attempts to tackle food waste on a global scale.

In this article, we follow the suggestion of de Hooge et al. (2017) and address the specific case of unwashed potatoes in Germany within the broad field of research on suboptimal foods. In addition to previous research objectives, we include further aspects like the consumers' usual shopping behavior, i.e. whether they buy organic regularly or not, and the influence of the consumers' familiarity with suboptimal products, as well as their awareness of a prolonged shelf life of the unwashed tubers. Our goal is therefore enhancing the explanatory power of the research activities currently undertaken in this field. We build upon the general overview on unwashed potatoes provided by Willersinn et al. (2017b) and synthesize their findings with recent results from the growing field of research on suboptimal food products. We adapt the research methodology previously applied in that regard by using a consumer survey (Loebnitz et al., 2015; Willersinn et al., 2017b).

Our results help to disentangle the complex interaction of general socio-demographic factors, consumer-specific attitudes and aspects related to the retail strategy to promote unwashed potatoes. The findings of our case study translate to a variety of further food products, particularly tubers, and provide insights even beyond Germany.

The article is organized as follows. In Sec. 2 we discuss the related literature as basis for our study. The survey and the sample are described in Sec. 3. The presentation of our results in Sec. 4 comprises univariate, multivariate and qualitative analyses. Finally, we conclude with a brief discussion.

2 Related Literature

Recent research on the acceptance of suboptimal produce indicates that consumers may have a relatively positive attitude towards suboptimal products (Loebnitz et al., 2015). It has been found that the decision making of the consumers regarding suboptimal products depends on a complex set of variables and that different properties of the products influence the likelihood of choice (Aschemann-Witzel et al., 2018b; de Hooge et al., 2017; Loebnitz et al., 2015; Symmank et al., 2018). The same holds true for individuals' behavior towards food waste (Secondi et al., 2015). Taking into account these factors can facilitate the design of policies or marketing campaigns targeted at specific consumer groups.

Within the present article, unwashed potatoes are considered as suboptimal products. The following presentation tries to clarify the determinants of consumers' corresponding purchasing choices and addresses three main aspects: i) the factors influencing the decision making of the consumers, which are mainly determined by their personal characteristics, e.g. their age or their awareness of the food waste issue; ii) the properties of the product itself that might interfere with the consumers' decision making process; and iii) the washing of potatoes.

2.1 Consumers' Preferences

Several studies suggest that younger consumers are more willing to purchase and consume suboptimal products (Aschemann-Witzel, 2018; de Hooge et al., 2017; de Hooge et al., 2018). Findings from de Hooge et al. (2017) even indicate that the age is the only variable correlating with the likelihood of choosing suboptimal foods. Interestingly, no difference between age groups regarding the willingness to purchase suboptimal fruits and vegetables was found in a study conducted in Uruguay (Aschemann-Witzel et al., 2018a). When consumers expressed their likelihood for a scenario, in which potatoes would be sold unwashed and in a lightproof box, there was no correlation with age, either (Willersinn et al., 2017b). It is suggested that the amount of food waste on consumers' side depends on the number of household members and whether there are children living in the household or not. Parizeau et al. (2015) found that in small households, there is an increasing food wastage per capita compared to bigger households. Further, in households with children, more food is wasted. The explanation for this seems to be straightforward as children are mostly more picky regarding their food and parents might be more concerned about food safety.

Moreover, there is some evidence of a gender effect regarding the choice of suboptimal foods. Aschemann-Witzel et al. (2018a) deduce that food waste avoidance messages on suboptimal foods are less likely to appeal to men compared to women as the latter ones seem to be more sustainability oriented. Part of that finding can be explained by women being generally more environmentally conscious and more open towards suboptimal products while men have been shown to be more attracted by price reductions (Lassen et al., 2016; Richter and Bokelmann, 2018). However, more research is also needed in this regard as other studies could not confirm this gender effect (de Hooge et al., 2017; Symmank et al., 2018).

Other socio-demographic aspects may play a role as well. For example, it was shown that people with lower income tend to be more likely to choose suboptimal products (Aschemann-Witzel et al., 2018b) and better educated consumers seem to be slightly more open to purchase optically imperfect products (Aschemann-Witzel, 2018). In their study, de Hooge et al. (2017) found that people with lower education needed a higher price discount before they would be willing to buy suboptimal products. The overall influence of education, however, seems to be a minor one.

Apart from the socio-demographic factors of the consumers, their likelihood to purchase suboptimal food is influenced by the complex realm of their psychographic variables. The motivation of the consumers to purchase suboptimal food may be rooted for example in thriftiness, especially when suboptimal products are offered at reduced prices, moral beliefs or in rather altruistic values, such as the concern for others' food security or sustainability. There is research in support of the notion that consumers who are committed to environmental sustainability are more likely to choose suboptimal products (de Hooge et al., 2017), but there are also studies that could not prove this hypothesis (Loebnitz et al., 2015). However, it can also be argued that consumers are not necessarily aware of the environmental benefits of reducing food waste. Hence, awareness of the food waste issue might increase the consumers' motivation to avoid food losses as their environmental consciousness is triggered. This is supported by research findings indicating that people are more inclined to purchase imperfect fruits and vegetables if they have a higher awareness of the problem of food loss (Loebnitz et al., 2015).

The social and cultural background of consumers also influences their expectations towards the food supply chain and the appearance of the products. Hence, awareness of the problems connected with the provision of food might alter the requirements towards food products. In this case, knowledge about production processes also plays a key role as it can enhance

the appreciation for food products, independent of their optical flawlessness. Urbanization and industrialization of the food supply chain can be argued to relate to a growing distance between food production and consumption. This is a possible explanation for the lack of understanding of the natural production systems that eventually lead to variation in the appearance of fruits and vegetables (Loebnitz and Grunert, 2018). Marketing is claimed to improve this situation by delivering knowledge and increasing awareness (de Hooge et al., 2018). Hence, retailers could engage in reducing food loss by offering suboptimal products and undertaking corresponding marketing actions. Furthermore, this might increase the familiarity with suboptimal foods, which will be discussed subsequently.

Suboptimal fruits and vegetables are seldomly presented to consumers in mainstream supermarket contexts, making the deviation from this norm more salient (Loebnitz et al., 2015; Loebnitz and Grunert, 2018). Probably driven by the increasing attention on the food waste issue, several retailers have started to promote product lines that include suboptimal fruits and vegetables during the last years (Mourad, 2016). This may shape the consumers' perception of such produce in the long run. Aschemann-Witzel et al. (2017) suggest that it is likely that consumers who are regularly confronted with wonky fruits and vegetables are more open to such products. With experience in the preparation of meals with suboptimal foods and the ability to estimate the quality of the food based on their sensory skills, their willingness to buy them may increase. Loebnitz et al. (2015) also stress that consumers are preferring products that seem familiar to them. A similar effect can be noticed when consumers are first tasting an unfamiliar product, increasing their general acceptance of this product later on. Thus, offering suboptimal products in supermarkets and associated marketing campaigns appear to shape the consumers perception over time and may increase their overall acceptance. With the current trend of introducing products with optical flaws, consumers might learn that natural foods are not cosmetically perfect.

2.2 Properties of the Food Products

Various Studies have found that differences in shape, size, color or texture result in a different willingness to purchase the respective products. These observations were made across countries and for a variety of fruits and vegetables, respectively (de Hooge et al., 2017; Di Muro et al., 2016; Loebnitz et al., 2015; Willersinn et al., 2017b). Loebnitz and Grunert (2018) even found that some consumers associate an abnormal shape with genetically modified products, evoking a certain level of rejection.

Data on the influence of earth covering unwashed potatoes is scarce. Willersinn et al. (2017b) chose that particular case and studied consumers' preference for unwashed potatoes in Switzerland. Table 1 gives an overview of their relevant survey results.

Table 1: Attitude towards unwashed potatoes (5-point likert scale, 1...full agreement)

Item	M	SD
I do not want to buy unwashed potatoes	1.98	1.16
I would not be happy if I had to wash potatoes myself	4.09	1.09
I would mind if tuber defects were hidden by the soil	3.03	1.15
I would buy unwashed potatoes if consequently losses decreased	1.98	1.06
I would buy unwashed potatoes in a non-transparent paperboard box if consequently losses decreased	2.27	1.12

Source: Study by Willersinn et al. (2017b) with 483 participants from Switzerland.

The research reveals that consumers would generally be willing to buy unwashed potatoes under the condition that this would help to reduce losses. Although the responses indicate that the reluctance is not salient, the inability to assess the tubers' quality due to earth

covering or a non-transparent packaging seems to be the main drawback for consumers.
The price of a product is often the most important factor in the decision making of consumers. The willingness to purchase suboptimal products has been shown to increase with a price reduction, but it also depends on the type of suboptimality (Aschemann-Witzel, 2018; de Hooge et al., 2017; de Hooge et al., 2018). Apparently, consumers are willing to buy almost every type of suboptimal product as long as the price is adequate for the type of suboptimality (de Hooge et al., 2017). A lower price is often associated with an inferior quality of the product. Thus, it could be argued that price reductions on suboptimal products pose the risk of establishing an image of poor quality. In case of price reductions for products close to their best-before dates, however, Aschemann-Witzel (2018) could not find any negative quality interference.

For a large part of consumers, naturalness is among the decisive factors when it comes to grocery shopping (Roman et al., 2017). Organic products are often associated with naturalness, as they often have more variability regarding their aesthetic properties resulting from different means of cultivation (Buder et al., 2014; Yue et al., 2009). Likewise, a product assortment that includes suboptimal fruits and vegetables is more variable concerning the appearance of the products. In this regard, it seems promising to sell suboptimal products to consumers, who emphasize the naturalness of products or who prefer organic food. A study conducted by Bunn et al. (1990) found that consumers were willing to purchase cosmetically imperfect fruits, when there was communication about the fact that the optically perfect fruits were treated with pesticides. In this case, the naturalness is perceived a more important property than the aesthetic value of the product. Further research is in support of the notion that suboptimal products are not perceived as such but rather as more natural for specific product segments or alternative marketing channels (Di Muro et al., 2016; Hermsdorf et al., 2017). However, a recent publication by Aschemann-Witzel (2018) also assumed that organic suboptimal products are preferred over conventional suboptimal products but could not validate this hypothesis. Yue et al. (2009) analyzed the willingness to pay for perfectly looking and suboptimal conventional and organic apples. It was found that the willingness to pay for a suboptimal apple compared to a perfect one was decreasing more strongly if the apple was organic. This challenges the hypothesis that for organic products, consumers perceive a deviation of shape or color as an indicator for naturalness. Overall, these results suggest that consumers generally prefer natural cultivation methods but are not willing to accept the drawback of these methods, namely a greater variance in appearance. This may also be connected to the organic products being more expensive (Roman et al., 2017).

2.3 Washing of Potatoes

About half of the potatoes destined for human consumption are sorted out, the majority of these due to quality requirements (Willersinn et al., 2015). More than 90% of the potatoes destined for fresh consumption are sold washed (Keiser et al., 2012). This stands in contrast to the potential loss reduction through selling unwashed potatoes (Willersinn et al., 2017b), e.g. through benefits from an increased shelf life. An analysis of different scenarios for a potential potato loss reduction revealed that selling potatoes unwashed and in a lightproof box is the most promising approach, as it increases the socio-economic performance of the supply chain and as it was generally accepted by consumers (Willersinn et al., 2017b). Further, it is suggested that the potato losses would be reduced by six percent through selling them unwashed and lightproof (Willersinn et al., 2016). However, it is not clear whether the earth covering alone would be sufficient or if a further packaging is necessary. A lightproof packaging is inconvenient as the quality of the tubers can not be assessed in

store, but the consumers' reluctance to such a packaging technology seems to be relatively low (Willersinn et al., 2017b).

Overall, inconvenience seems to be the main drawback regarding the sale of unwashed potatoes (Willersinn et al., 2017b). Next to a possible increased effort for the retailers to keep the point of sale free from earth, the consumers need to take care of the washing. It can be suggested that the overall water consumption increases if the washing is performed at home compared to industrial washing facilities. Further, the washing at home probably reveals certain optical shortcomings, and it is in question if this would cause a shift of food losses to the consumers' sphere. However, it is important to note that consumers show a different attitude towards suboptimal foods in the situation in store versus at home, because consumers tend to react differently if they already have the property rights for a product. In their study, de Hooge et al. (2017) also show that consumers are more likely to choose a suboptimal product at home, which suggests that consumers do not necessarily dispose potatoes if they detect impairments after washing.

2.4   Summary

The related literature on suboptimal foods and the consumers preference for such products reveals that many issues remain unclear as data are contradictory and scarce. The latter fact is especially true in case of consumers' preference for unwashed potatoes. However, this might be related to the studies having conducted their research in different countries or addressed products that differ from each other. Therefore, a comparison of the findings seems rather challenging. Clearly, the explanatory power of the resulting conclusions suffer from this. In this regard, the first conclusions of this literature review is a claim for a more robust database. Further, the literature demonstrates a clear need to reduce the food losses of potatoes, which account to about fifty percent of the initial production and a large share of these losses are due to cosmetic specifications (Willersinn et al., 2015). Integrating suboptimal foods in the product assortment can contribute to shape a brand image of retailers and, for the sale of unwashed potatoes, it was shown that the socio-economic performance would increase (de Hooge et al., 2018; Hermsdorf et al., 2017; Willersinn et al., 2017b). The section on the consumer preferences revealed that the decision making process of consumers is influenced by a complex set of variables, but it seems, however, that younger, more educated people without children tend to be more open towards suboptimal produce in general (de Hooge et al., 2017) or at reduced prices (Aschemann-Witzel, 2018). Moreover, knowledge about the food waste issue and a pro-environmental attitude, as well as being accustomed to suboptimal foods contribute to the willingness to purchase such products (Aschemann-Witzel et al., 2017; Loebnitz et al., 2015). The influence of the product being organic or not remains unclear (de Hooge et al., 2017; Di Muro et al., 2016). The sale of unwashed potatoes can reduce the food losses in multiple ways and was generally accepted by consumers as discovered by Willersinn et al. (2017b). Their study is, however, limited to Switzerland.

Based on the complex set of potential factors identified to influence the willingness to purchase unwashed potatoes, the following study sheds light on the case of consumers of Germany.

3   Data Collection

Our empirical study builds upon the recent work of Willersinn et al. (2017b). Conducting a survey also follows the well-proven methodology in that area of research. The survey

consisted of a total of 26 questions to cover the aspects relevant to our research questions, while keeping its overall length in an appropriate range.

Our questionnaire was divided into three main parts:

A Questions on household characteristics and general food buying and consumption;

B Questions on specific attitudes and perceptions, including general ones and those regarding potatoes; and

C Standard socio-demographic questions and open comments.

In particular, part A asked for the participant's household size (single household up to four or more persons) and whether minor children where living in the household. The frequency of doing grocery shopping and cooking for the household was assessed on a 5-point scale (from "always" to "never"). The household income and share of organic food products purchased within the last 12 months was also assessed on a 5-point scale. In the last questions from part A, participants were asked how often they ate potatoes.

In part B, most of the questions were matrices to assess the psychometric properties of the consumers. The matrices were made up of item batteries with up to six individual items representing variables found to be relevant in the literature. Participants were asked to evaluate each of these items on a 5-point Likert scale ranging from "totally agree" to "totally disagree", or in two cases from "always" to "never", respectively.

The first two item batteries, representing consumers' *attitude towards the environment* and *intention to avoid food losses*, were adopted from Loebnitz et al. (2015). In the following, participants were shown six pictures of different fruits and vegetables that deviate from the norm in terms of their outer appearance and then answered two item batteries that formed the variables *familiarity with such suboptimal products* and *attitude towards such suboptimal products*. Subsequently, participants were shown two pictures of washed and unwashed potatoes, respectively. Then, they indicated how often and where they had already purchased unwashed potatoes. After that, the *perceived inconvenience of unwashed potatoes* was assessed as a further variable adopted from Willersinn et al. (2017b).

Then, participants answered the central items of the survey regarding their willingness to purchase (WTP) for unwashed potatoes without and with a price reduction. Following the literature, the items were formulated as "I would not buy unwashed potatoes" and "I would only buy unwashed potatoes with a price discount". The next two variables were also adopted from Willersinn et al. (2017b) and captured consumers' *knowledge about potatoes*, including questions on potato storage, and their *knowledge about the food waste issue*. The next battery formed the variable *specific knowledge about unwashed potatoes*.

To study the effect of information about the potential benefits of unwashed potatoes on reducing food loss, participants were ask to carefully read the following text at the end of part B:

> "*Scientific studies have shown that about half of the potatoes that are produced for human consumption are finally not eaten. The reasons for that are complex. Today, about 90 percent of the potatoes are washed and sorted, before they are offered at the retail stages.*
> *Unwashed potatoes have a longer shelf life than washed potatoes and the earth covering hinders the sorting out of tubers due to optical criteria. Therefore, selling unwashed tubers is an approach to reduce food losses of the potato.*"

Participants were then again asked to answer the two questions regarding their WTP for unwashed potatoes without and with price discount.

The survey concluded with part C, where participants answered questions regarding a set of standard socio-demographic questions (their country of residence, gender, age, and educational level). They also had the opportunity to express their comments using an open text field.

To guarantee readability and clarity of the questionnaire, a pretest was conducted with 12 participants. The final survey was conducted online during May and June 2018 and provided participants with an English and a German version of the questionnaire. The data collection approach is a convenience sample. Tab. 2 summarizes the main sample characteristics.

Table 2: Summary of the survey sample.

Total Number of Participants	307
Age (in years)	M: 32.7, SD: 11.6
Share of Female Respondents	65.1%
Share of Academic Respondents	74.8%
Share of Single Households	23.2%
Share of Households with children	15.5%
Share of German Residents	98.0%

Note: Some participants did not answer all questions.

4   Results

Before looking into the detailed results of our study, we report the participants' general experience with unwashed potatoes. In our sample, only 39.8% stated that they did not buy unwashed potatoes during the last 12 months. This means that more than 60% already had purchasing experience. In particular, 12.1% of the participants answered that they would buy the majority of their potatoes unwashed.[1] This hints on a notable open attitude towards such tubers among German consumers. When asked where they had bought the unwashed potatoes, conventional supermarkets represented only about one fifth (20.8%) of the relevant point of sales. The majority of consumers buys unwashed potatoes at alternative sales channels like organic supermarkets, farmer's markets or directly at a farm. This result fits with the observation of Hermsdorf et al. (2017) that organic retailers are less reluctant to sell suboptimal food.

4.1   Univariate Analysis

Consumers' WTP for unwashed potatoes is the central variable of interest in our study. Tab. 3 shows the average values for the WTP in the baseline setting without information and without discount, as well as in the remaining three settings with discount (subindex D) and/or with additional information on the benefits of selling unwashed potatoes (subindex I). We also report the average values distinguishing the gender of consumers.

We find that the WTP is generally high, with average values above 3.8 across all settings and genders. For all consumers, we observe that providing additional information on unwashed potatoes significantly increases the WTP both without discount (Wilcoxon signed-ranks test: $p = 0.0018$, one sided) and with discount for unwashed potatoes (Wilcoxon signed-ranks test: $p = 0.0009$, one sided). When looking at gender differences, we find that for female consumers a price discount is significantly less important than for male consumers,

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[1] Note that the exact answer was "more than 67% of the potatoes".

Table 3: Willingness to purchase for unwashed potatoes (with discount and/or information).

Respondents	n	WTP	WTP_D	WTP_I	$WTP_{D,I}$
Total[a]	248	4.52	4.07	4.65	4.23
Female	158	4.52	4.22	4.65	4.35
Male	86	4.51	3.84	4.61	3.93
Gender Difference[b]	-	no	yes ($p = 0.0071$)	no	yes ($p = 0.0007$)

[a] 4 of the participants did not select one of the two genders.
[b] Mann-Whitney-U test (all p-values one-sided).

see the last row in Tab. 3. The observation that male consumers are more attracted by price discounts is in line with the current literature (Lassen et al., 2016; Richter and Bokelmann, 2018). We conclude our first and central finding:

Result 1. *Information about selling unwashed potatoes as an approach to reduce food losses has a significant, positive effect on the willingness to purchase. This holds for both genders. In contrast, male consumers are significantly more attracted by a price discount for unwashed potatoes than female consumers.*

We now study the impact of the further information collected on the WTP. Tab. 4 reports the Spearman rank-order correlation coefficients r_s for different variables and the WTP under the four studied settings.[2]

Table 4: Influence on willingness to purchase: correlation coefficients.

Item	n	WTP	WTP_D	WTP_I	$WTP_{D,I}$
Age	244	0.058	0.118*	−0.063	0.058
Education	236	0.017	0.019	−0.067	−0.027
Household (Size)	248	−0.003	−0.036	0.033	−0.014
Household (Income)	214	0.055	0.071	−0.030	0.032
Cooking (Frequency)	247	−0.086*	−0.173***	−0.110**	−0.086*
Grocery Shopping (Frequency)	247	0.158***	−0.071	0.103**	0.008
Organic Food (Purchase)	235	0.247***	0.249***	0.246***	0.265***
Pro Environment (Attitude)	244	0.311***	0.281***	0.304***	0.219***
Food Losses (Attitude)	243	0.256***	0.206***	0.303***	0.178***
Suboptimal Products (Attitude)	242	−0.120**	−0.165***	−0.190***	−0.182***
Suboptimal Products (Familiarity)	230	−0.268***	−0.204***	−0.162***	−0.141**
Potatoes (Consumption)	248	0.109**	0.121**	0.052	0.121**
Unwashed Potatoes (Knowledge)	111	0.204**	0.124*	0.072	0.129*
Unwashed Potatoes (Inconvenience)	245	0.582***	0.502***	0.462***	0.442***
Unwashed Potato (Purchase)	241	0.373***	0.398***	0.227***	0.319***

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ (all p-values one-sided).

It seems that the remaining socio-demographic variables age, education, household size and household income do not have a significant impact on customers' WTP. This fits with the mixed results from previous studies reported in the literature. Only a slight correlation is found between age and the WTP_D hinting on younger customers being attracted by price discounts for unwashed potatoes. Consumers cooking more often or consuming potatoes

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[2]The reliability of the variables formed by the item batteries was tested using Cronbachs α. According to the meta-analysis of Peterson (1994) on Cronbachs α, a coefficient of 0.70 is average for belief and value constructs. All α for the variables used in the present study are above or close to this threshold and are reported in App. A.

more frequently report a significantly higher WTP than those cooking or consuming potatoes less often. Surprisingly, we find no relation between consumers frequency of household grocery shopping and their response towards discounted unwashed potatoes. As expected, we find a significant positive relation between the WTP and reported share of certified, organic products purchased and unwashed potatoes purchased in the past.

Using these insights, we conclude our second finding:

Result 2. *While younger consumers reveal a slightly increased WTP for discounted unwashed potatoes, the remaining demographic variables do not significantly influence the WTP. A significant positive correlation exists between consumers' responsibility for household cooking and their WTP. The same is true for general potato consumption. Consumers' responsibility for household grocery shopping is only significantly positively correlated with their WTP for unwashed potatoes in the absence of a price discount.*

The variable capturing whether a child was living in the household is not reported in Tab. 4 because it was collected as a binary variable. When comparing households without and with children, we find significant differences with a higher WTP expressed by the latter ones (Mann-Whitney-U test: for WTP $p = 0.0838$, for WTP_D $p = 0.0401$, all p-values one-sided). After informing the participants about the benefits of unwashed potatoes, the difference persists at least in the setting with discount (Mann-Whitney-U test: for WTP_I $p = 0.2946$, for $\text{WTP}_\text{D,I}$ $p = 0.0495$, all p-values one-sided). These observations are not fully in line with previous studies, which suggested that households without children would tend to be more open towards suboptimal products (de Hooge et al., 2017).

We now turn our analysis towards the variables constructed to study consumers' attitudes, familiarity, knowledge and perception of inconvenience. We find that most of those variables are strongly and significantly correlated with the WTP, independent of price discounts or information regarding unwashed potatoes. A notable exception is the knowledge about unwashed potatoes. It is only strongly positively correlated with the WTP in the baseline setting while in the other settings, the correlation is only slightly positive, if significant at all.[3] We conclude the univariate part of our analysis with our third finding:

Result 3. *The WTP unwashed potatoes is significantly higher for consumers with an attitude in favor of environmental issues and suboptimal products and against food losses. A greater familiarity with suboptimal products and a smaller perceived inconvenience have the same correlation. This result is true across all settings without and with price discount or information about unwashed potatoes.*

4.2 Multivariate Analysis

To analyze the interaction of the set of variables incorporated in our study, we conduct regression analyses for the WTP in the four settings. We use our corresponding four central variables as independent variables. Taking into account the ordinal scale of these and other variables in our survey, we perform ordered logistic regressions. We start with the full model including all variables with the exception of *knowledge about unwashed potatoes* due to its limited number of observations and *knowledge about food losses* due to its insufficient reliability. Then, we reduce the number of explanatory variables omitting those without significant effect. The Tab. 5a to Tab. 5d below report the results of the reduced regression

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[3]Note that the number of valid observations is relatively small for that variable. This might at least partially explain the absence of highly significant correlations in the remaining settings.

model for the willingness to purchase unwashed potatoes in the four settings without and with discount and/or information.[4]

Table 5: Ordered-logistic regression results: reduced models

			Number of obs.	=	227
			LR chi^2(4)	=	149.18
			Prob > chi^2	=	0.0000
Log likelihood = -131.438			Pseudo R^2	=	0.3620

	$Coef.$	SD	z	$P > |z|$	[95% Conf. Interval]	
Pro Environment (Attitude)	0.668	0.026	2.55	0.011	0.155	1.181
Suboptimal Products (Familiarity)	-0.702	0.290	-2.42	0.015	-1.270	-0.134
Unwashed Potatoes (Inconvenience)	2.218	0.270	8.22	0.000	1.689	2.747
Unwashed Potatoes (Purchase)	0.704	0.237	2.97	0.003	0.240	1.168

(a) Dependent Variable: WTP (STATA output)

			Number of obs.	=	247
			LR chi^2(4)	=	99.78
			Prob > chi^2	=	0.0000
Log likelihood = -267.307			Pseudo R^2	=	0.1573

	$Coef.$	SD	z	$P > |z|$	[95% Conf. Interval]	
Cooking (Frequency)	-0.219	0.135	0-1.62	0.104	-0.482	0.045
Unwashed Potatoes (Inconvenience)	1.289	0.175	7.35	0.000	0.945107	1.632
Unwashed Potatoes (Purchase)	0.633	0.151	4.19	0.000	0.337	0.929

(b) Dependent Variable: WTP$_D$ (STATA output)

			Number of obs.	=	244
			LR chi^2(4)	=	84.63
			Prob > chi^2	=	0.0000
Log likelihood = -131.256			Pseudo R^2	=	0.2438

	$Coef.$	SD	z	$P > |z|$	[95% Conf. Interval]	
Food Losses (Attitude)	1.388	0.351	3.95	0.000	0.699	2.076
Unwashed Potatoes (Inconvenience)	1.684	0.248	6.80	0.000	1.199	2.170

(c) Dependent Variable: WTP$_I$ (STATA output)

			Number of obs.	=	231
			LR chi^2(4)	=	92.22
			Prob > chi^2	=	0.0000
Log likelihood = -228.239			Pseudo R^2	=	0.1681

	$Coef.$	SD	z	$P > |z|$	[95% Conf. Interval]	
Gender	-0.805	.286	-2.81	0.005	-1.365	-0.244
Household (Size)	-0.641	0.370	-1.73	0.083	-1.366	0.0835
Organic Food (Purchase)	0.413	0.116	3.55	0.000	0.185	0.641
Potatoes (Consumption)	0.434	0.191	2.27	0.023	0.059	0.808
Unwashed Potatoes (Inconvenience)	1.316	0.185	7.11	0.000	0.953	1.679

(d) Dependent Variable: WTP$_{D,I}$ (STATA output)

The regression results indicate differences among the four settings, while yielding satisfactory values regarding the model fit with R^2 values between 0.16 (WTP$_D$) and 0.36 (WTP). The main insights are threefold: i) in each setting, only a small number of variables exerts a significant influence on the WTP, ii) this limited set of variables is quite diverse across the four settings and includes socio-demographic aspects and attitudes as well as purchase

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[4]In Tab. 7 to Tab. 10 in App. B, we report the results for the corresponding full regression models and present the correlation table of the independent variables.

behavior, and iii) the perceived inconvenience of unwashed potatoes is the main factor of influence in all settings. The last point is fully in line with the conclusion made by Willersinn et al. (2017b).

In the baseline setting without discount and without information, a pro-environmental attitude and familiarity with suboptimal products increase consumers' willingness to purchase unwashed potatoes. This confirms the findings from de Hooge et al. (2017) regarding the positive effect of consumers' commitment on environmental and sustainability issues on their WTP and from Aschemann-Witzel et al. (2017) regarding familiarity with suboptimal products. Additionally, consumers perceiving less inconvenience with unwashed potatoes and those with previous purchase experience tend to express a higher WTP. The latter two variables are also relevant in the setting with a price discount for unwashed potatoes. The third and last variable increasing WTP_D is a higher frequency of cooking for the household.

In the setting with information, i.e. after being explicitly informed about the potential benefits of selling unwashed potatoes, the variables exerting a significant influence on the WTP change for both situations without and with discount. In the absence of a price discount, the only remaining variable besides the consumers' perceived inconvenience is the attitude towards food losses. This fits with an observation made by Loebnitz et al. (2015). Note that it is also the only variable in all four settings whose magnitude of the impact on the WTP (expressed by the coefficients in the regression table) comes close to that of the perceived inconvenience. In the case of a price discount, giving explicit information regarding unwashed potatoes not only changes the type variables with a significant impact on the WTP, but also increases their number. In this setting, male consumers and consumers living in smaller households express a lower WTP, while those already purchasing organic food and eating more potatoes in general express a higher WTP.

With help of the multivariate analysis using regression analysis, we have shed light on the complex factors related to consumers' WTP for unwashed potatoes. We conclude our fourth and final finding:

Result 4. *The predominant factor regarding the willingness to purchase unwashed potatoes is consumers' perceived inconvenience. This is true in all settings. Consumers familiar with suboptimal products and having a positive attitude towards the environment express a higher WTP in the baseline setting without discount and additional information. When additional information is given, results differ: a positive attitude towards avoiding food losses drives the WTP in the absence of a price discount; discounts for unwashed potatoes are more important for male consumers than for female consumers.*

4.3 Qualitative Analysis

Last we discuss the insights extracted from the consumers' open comments.[5] This input is particularly useful in our survey in light of the relevance of qualitative factors like beliefs and attitudes playing an important role in the food waste issue.

The inconvenience of buying unwashed potatoes was mainly referred to the earth causing more dirt during transport and preparation. Several participants highlighted the fact that washing the potatoes at home might be less ecological in the end due to the high water consumption. A consumer used to by unwashed potatoes in the past even tended to still wash the potatoes once again at home even if she had bought already washed ones.

To complement the information of the benefits of selling unwashed potatoes, participants

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[5]About 6% of the participants provided open answers related to the qualitative questions of the survey. We therefore classified the comments on an individual base rather than a using structured coding approach.

suggested to share information on the correct storage to extend their shelf life and to offer tools to effectively clean them before preparation in the kitchen. In general, reducing the industrial food packaging was also proposed as a desirable target for retailers.

Since the appearance of washed potatoes is relatively new in human history, one participants suspected that consumers might be educated to get used to unwashed ones, again. However, their tendency to stick to recent habits might render the introduction of unwashed potatoes at large scale difficult nowadays. In addition, consumers might increase their peeling effort if having bought unwashed potatoes to end up with really "clean" ones.

Finally, one new aspect was mentioned by a participant: some consumers might feel they pay a lot for something they will not use as the earth increases the weight of the bought potatoes.

5   Discussion and Conclusion

At least for consumers in Germany, our results fit with the finding that retailers might underestimate the consumers' willingness to buy suboptimal products (de Hooge et al., 2018). However, many conventional market actors perceive logistic constraints, internal competition and the consumers preferences as hindering factors in selling suboptimal products, although it seems to be well established among organic traders (Hermsdorf et al., 2017). Given the fact that alternative sales channels already manage to attract consumers willing to buy unwashed potatoes, conventional supermarkets might benefit from reviewing their current marketing and logistics practices. From our two main findings, we derive the following related implications.

Informing consumers about the benefits of buying unwashed potatoes offers an effective measure to increase their WTP. Such information can be provided directly at the point of sale, together with the product itself, or via marketing campaigns. Awareness regarding food loss and more natural or organic food products therefore can help to reduce food waste both at the retail level and at consumers.

For the latter ones, the inconvenience was identified as the main factor reducing their WTP. Because this is in line with previous findings from other country studies, particular attention should be paid to that aspect. A package that protects the unwashed potatoes and reduces dirt and dust appears to be the natural response to that inconvenience. However, possible changes in the ecological balance have to be taken into account.[6]

When transferring the insights on the WTP discovered in this article into practical applications, it is important to note that there might be a gap between the intention to act in a certain way and the actual behavior (Carrigan and Attalla, 2001; Moser, 2015). As known from Chang and Wildt (1994), this is particularly true in the case of purchase intentions. A further limitation for the transfer of the results of our study is the convenience sample, where the representation of young and relatively well educated as well as of female consumers is very high. While the first two aspects are clearly not representative for the population as a whole, the dominance of female consumers seems acceptable considering the focus on grocery shopping responsibility.

Overall, our results underline the complexity of consumers' purchase behavior. Hence, we see avenues for further research. In particular, testing the derived results in a field experiment, i.e. in retail situations, may help to evaluate the interacting effects of information, packaging and price differences on actual purchase decisions. Finally, understanding the

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[6]For the case of unwashed potatoes in Switzerland, Willersinn et al. (2017a) present such a *Life-Cycle Assessment* of the total supply chain. A more general analysis of supermarket food waste is conducted in Brancoli et al. (2017).

motives and experiences of the actors of the food supply chain should complement the investigation of selling unwashed potatoes as a measure to reduce food losses. The ambitious goal of SDG 12.3 can only be achieved, if the actors along whole chain are involved.

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A   Construction of Variables

We report means (M) and standard deviations (SD) per item (statements or questions). For all variables we additionally report internal reliability (Cronbachs α) and number of items (N) used for their construction and indicate the orientation of the scale. Please note that lower values initially correspond with a stronger agreement to the statements.

Table 6: Questionnaire items and variable construction.

Variable/Question ([a] Item coding reversed ($1 \rightarrow 5$); [b] Item excluded to increase α)	M	SD
Pro-environmental attitude (5 = highly environmentally friendly, $\alpha = 0.71$, N = 3)	*3.84*	*0.74*
I consider myself an environmentally friendly consumer.[a]	3.83	0.88
I consider myself as someone who is very concerned with sustainability issues.[a]	4.19	0.79
For me, it takes too much time and effort to do things that are environmentally friendly.	3.51	1.08
The environment is a low priority for me compared with a lot of other things in my life.[b]	4.22	1.07
Intention to avoid food losses (5 = high intention, $\alpha = 0.77$, N = 5)	*4.78*	*0.44*
It is important to me that all purchased food will be eaten.[a]	4.74	0.57
I mostly try to waste no food at all.[a]	4.87	0.38
I don't care if food is wasted.	4.86	0.35
I aim to use all leftovers.[a]	4.53	0.74
I think that wasting food is a waste of money.[a,b]	4.60	0.69
I feel bad when food is thrown away.[a]	4.58	0.79
Familiarity with suboptimal products (1 = high familiarity, $\alpha = 0.71$, N = 4)	*2.95*	*0.67*
How often do you notice suboptimal products when you go shopping?	3.68	0,95
During the past 12 months, how often did you buy suboptimal products?	3.48	0.99
How often would you buy suboptimal products if they were always available?	1.94	0.86
How often have you already consumed suboptimal products?	2.85	0.86
Attitude towards suboptimal products (1 = highly in favor, $\alpha = 0.60$, N = 2)	*1.34*	*0.59*
Selling suboptimal products reduces the amount of food that is wasted.	1.41	0.76
From an ecological point of view, it does not make sense to sell suboptimal products.[a,b]	1.27	0.69
Retailers should sell suboptimal products more frequently.	1.30	0.66
Perceived inconvenience of unwashed potatoes (1 = high inconvenience, $\alpha = 0.60$, N = 3)	*4.11*	*0.81*
I would mind if I had to wash the potatoes myself.	4.31	0.96
I would not mind if I would detect tuber defects after washing.[a]	3.64	1.23
I think that the consumption of unwashed potatoes poses a health risk.[b]	4.49	0.77
Unwashed potatoes have a lower quality.[b]	4.87	0.43
To prepare unwashed potatoes would be too inconvenient for me.	4.37	0.92
General knowledge about potatoes (internal reliability insufficient)	-	-
Private households waste very few fresh potatoes.	3.20	0.88
Unprepared fresh potatoes should always be stored in the refrigerator	4.63	0.72
Fresh potatoes that have been purchased > 2 weeks ago should be disposed even if they still look fine.	4.88	0.40
Fresh potatoes should be stored in the dark.[a]	4.70	0.62
Green spots on potatoes should be at least cut off.[a]	4.21	0.97
Light makes the potatoes turn green and speed up the ageing.[a]	4.33	0.86
Knowledge about food losses (internal reliability insufficient)	-	-
Households that plan their shopping purposefully waste less food than households that do not plan food purchases.	1.80	0.90
Someone who buys smaller amounts of food wastes less food.	2.21	1.06
Food production and supply harm the environment considerably.	1.90	0.88
Knowledge about unwashed potatoes (5 = high knowledge, $\alpha = 0.70$, N = 2)	*3.32*	*1.13*
Unwashed potatoes have a longer shelf life than washed potatoes.[a]	3.32	1.36
Selling unwashed potatoes can reduce the amount of food wasted.[a]	3.12	1.24
Washed potatoes are more aesthetic than unwashed potatoes.[a,b]	3.05	1.32
Unwashed potatoes are more natural than washed potatoes.[b]	2.42	1.31

B Full Regression Models

In this appendix, we present the results for the ordered logistics regression including all the variables from our survey (full regression model) and the correlation table for the variables. Tab. 7 to Tab. 10 report the regression results and Tab. 11 shows the Spearman rank correlation coefficients for all the ordinal variables that are used as independent variables

in the regression analysis.[7]

Table 7: Full Regression Model, Dependent Variable: WTP (STATA output)

				Number of obs	=	162
				LR chi2(4)	=	112.92
				Prob > chi2	=	0.0000
Log likelihood = −92.355				Pseudo R2	=	0.3794

	$Coef.$	SD	z	$P > \mid z \mid$	[95% Conf.	Interval]
Age	-0.031	0.028	-1.10	0.273	-0.086	0.024
Gender	0.045	0.478	0.09	0.925	-0.892	0.982
Education	0.072	0.133	0.55	0.585	-0.187	0.332
Household (Size)	-0.083	0.205	-0.40	0.686	-0.485	0.319
Household (Children)	0.084	0.716	0.12	0.906	-1.318	1.487
Household (Income)	0.184	0.221	0.83	0.404	-0.249	0.618
Cooking (Frequency)	-0.007	0.252	-0.03	0.977	-0.500	0.486
Grocery Shopping (Frequency)	0.288	0.354	0.81	0.416	-0.407	0.982
Organic Food (Purchase)	-0.196	0.246	-0.80	0.426	-0.679	0.287
Pro Environment (Attitude)	0.443	0.375	1.18	0.237	-0.291	1.178
Food Losses (Attitude)	-0.353	0.612	-0.58	0.564	-1.552	0.846
Suboptimal Products (Attitude)	0.204	0.383	0.53	0.595	-0.547	0.954
Suboptimal Products (Familiarity)	-0.836	0.366	-2.28	0.022	-1.554	-0.118
Potatoes (Consumption)	0.241	0.331	0.73	0.466	-0.408	0.891
Unwashed Potatoes (Purchase)	0.813	0.316	2.57	0.010	0.193	1.432
Unwashed Potatoes (Inconvenience)	2.390	0.341	7.01	0.000	1.722	3.058

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[7]Note that the two additional variables *gender* and *children living in the household* are not included in the correlation table because of their binary measurement scale.

Table 8: Full Regression Model, Dependent Variable: WTP_D (STATA output)

				Number of obs	=	162
				LR chi2(4)	=	90.24
				Prob > chi2	=	0.0000
Log likelihood = −155.966				Pseudo R2	=	0.2244

	$Coef.$	SD	z	$P > |z|$	[95% Conf. Interval]	
Age	-0.017	0.020	-0.85	0.397	-0.057	0.023
Gender	-1.067	0.372	-2.87	0.004	-1.796	-0.338
Education	-0.004	0.103	-0.04	0.966	-0.207	0.198
Household (Size)	0.212	0.172	1.24	0.217	-0.125	0.549
Household (Children)	0.339	0.560	0.61	0.545	-0.759	1.438
Household (Income)	0.043	0.177	0.24	0.807	-0.303	0.390
Cooking (Frequency)	-0.119	0.220	-0.54	0.588	-0.550	0.312
Grocery Shopping (Frequency)	-0.321	0.279	-1.15	0.249	-0.868	0.226
Organic Food (Purchase)	0.129	0.172	0.75	0.454	-0.209	0.467
Pro Environment (Attitude)	-0.097	0.295	-0.33	0.743	-0.674	0.481
Food Losses (Attitude)	-0.446	0.507	-0.88	0.379	-1.439	0.547
Suboptimal Products (Attitude)	-0.093	0.292	-0.32	0.751	-0.666	0.480
Suboptimal Products (Familiarity)	0.0482	0.280	0.17	0.863	-0.500	0.596
Potatoes (Consumption)	0.017	0.252	0.07	0.947	-0.478	0.511
Unwashed Potatoes (Purchase)	0.704	0.225	3.13	0.002	0.263	1.145
Unwashed Potatoes (Inconvenience)	1.646	0.2483	6.63	0.000	1.160	2.133

Table 9: Full Regression Model, Dependent Variable: WTP_I (STATA output)

				Number of obs	=	162
				LR chi2(4)	=	63.64
				Prob > chi2	=	0.0000
Log likelihood = −83.092				Pseudo R2	=	0.2769

	$Coef.$	SD	z	$P > |z|$	[95% Conf. Interval]	
Age	-0.066	0.027	-2.44	0.015	-0.119	-0.013
Gender	-0.244	0.527	-0.46	0.643	-1.277	0.789
Education	-0.035	0.154	-0.23	0.820	-0.338	0.268
Household (Size)	0.346	0.260	1.33	0.183	-0.163	0.855
Household (Children)	-1.018	0.726	-1.40	0.161	-2.441	0.405
Household (Income)	0.205	0.250	0.82	0.411	-0.284	0.695
Cooking (Frequency)	-0.114	0.294	-0.39	0.699	-0.690	0.463
Grocery Shopping (Frequency)	0.038	0.374	0.10	0.919	-0.695	0.771
Organic Food (Purchase)	0.197	0.282	0.70	0.485	-0.36	0.749
Pro Environment (Attitude)	0.200	0.406	0.49	0.622	-0.595	0.995
Food Losses (Attitude)	0.636	0.561	1.13	0.257	-0.463	1.735
Suboptimal Products (Attitude)	-0.106	0.341	-0.31	0.756	-0.774	0.562
Suboptimal Products (Familiarity)	-0.112	0.392	-0.29	0.775	-0.879	0.655
Potatoes (Consumption)	-0.027	0.361	-0.08	0.940	-0.735	0.680
Unwashed Potatoes (Inconvenience)	1.839	0.344	5.34	0.000	1.164	2.513
Unwashed Potatoes (Purchase)	0.127	0.350	0.36	0.716	-0.559	0.813

Table 10: Full Regression Model, Dependent Variable: WTP$_{D,I}$ (STATA output)

				Number of obs	=	161
				LR chi2(4)	=	81.84
				Prob > chi2	=	0.0000
Log likelihood $= -145.605$				Pseudo R2	=	0.2194
	Coef.	*SD*	*z*	*P > |z|*	\[95% Conf.	Interval]
Age	-0.045	0.0216	-2.09	0.037	-0.087	-0.003
Gender	-1.326	0.378	-3.51	0.000	-2.066	-0.586
Education	0.022	0.105	0.21	0.837	-0.184	0.227
Household (Size)	0.222	0.174	1.28	0.202	-0.119	0.562
Household (Children)	-0.010	0.5623	-0.02	0.985	-1.112	1.092
Household (Income)	0.202	0.185	1.09	0.274	-0.160	0.565
Cooking (Frequency)	0.094	0.213	0.44	0.659	-0.324	0.512
Grocery Shopping (Frequency)	-0.480	0.283	-1.69	0.090	-1.035	0.075
Organic Food (Purchase)	0.327	0.186	1.76	0.079	-0.038	0.691
Pro Environment (Attitude)	-0.035	0.303	-0.12	0.907	-0.629	0.558
Food Losses (Attitude)	-0.306	0.493	-0.62	0.534	-1.272	0.659
Suboptimal Products (Attitude)	-0.081	0.298	-0.27	0.786	-0.665	0.503
Suboptimal Products (Familiarity)	0.133	0.280	0.48	0.634	-0.416	0.682
Potatoes (Consumption)	0.382	0.274	1.39	0.163	-0.155	0.918
Unwashed Potatoes (Inconvenience)	1.560	0.248	6.29	0.000	1.074	2.047
Unwashed Potatoes (Purchase)	0.485	0.236	2.06	0.040	0.023	0.947

Table 11: Spearman rank correlations r_s: independent variables (STATA output)

(n = 165)	i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.	x.	xi.	xii.	xiii.	xiv.
i. Age	1													
ii. Education	0.224	1												
iii. Household (Size)	0.027	-0.148	1											
iv. Household (Income)	0.394	0.153	0.278	1										
v. Cooking (Frequency)	-0.171	0.003	0.202	-0.056	1									
vi. Grocery Shopping (Frequency)	-0.157	0.013	0.369	0.167	0.490	1								
vii. Organic Food (Purchase)	0.071	0.074	0.161	0.161	0.002	-0.014	1							
viii. Pro Environment (Attitude)	0.066	0.162	0.107	0.099	-0.155	-0.019	0.453	1						
ix. Food Losses (Attitude)	-0.132	-0.123	0.042	-0.060	-0.187	-0.047	0.158	0.346	1					
x. Suboptimal Products (Attitude)	-0.054	0.090	0.055	-0.044	0.117	0.034	-0.083	-0.107	-0.254	1				
xi. Suboptimal Products (Familiarity)	-0.131	-0.078	-0.188	-0.101	0.035	-0.107	-0.214	-0.155	-0.120	0.132	1			
xii. Potatoes (Consumption)	0.199	-0.083	0.148	0.065	-0.142	0.021	0.030	0.081	0.026	-0.127	0.012	1		
xiii. Unwashed Potatoes (Inconvenience)	0.049	-0.029	-0.098	0.079	-0.109	0.009	0.185	0.213	0.276	-0.159	-0.077	-0.007	1	
xiv. Unwashed Potatoes (Purchase)	0.203	0.129	-0.036	0.069	-0.092	-0.010	0.485	0.343	0.236	-0.032	-0.236	0.213	0.289	1