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"The road to food waste is paved with good intentions": when consumers' goals inhibit the minimization of household food waste / Barone, Ada Maria; Grappi, Silvia; Romani, Simona. - In: RESOURCES, CONSERVATION AND RECYCLING. - ISSN 0921-3449. - 149:(2019), pp. 97-105.  
[10.1016/j.resconrec.2019.05.037]

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05/01/2026 18:56

This is the post-print version of the following article:

Barone A. M., Grappi S., Romani S. (2019). "The road to food waste is paved with good intentions": When consumers' goals inhibit the minimization of household food waste *Resources, Conservation & Recycling*, 149, 97-105.  
<https://doi.org/10.1016/j.resconrec.2019.05.037>

The final publication is available at: <https://www.sciencedirect.com/science/article/pii/S0921344919302514>

## **"The road to food waste is paved with good intentions": when consumers' goals inhibit the minimization of household food waste**

### **Abstract**

Despite their generally negative attitude toward food waste, consumers often pursue goals that can inhibit their intention to reduce food waste. Identifying these goals that inhibit consumers' intention to reduce food waste is essential for the development of successful public policy and retail approaches designed to curb or reduce household food waste. First, we conducted semi-structured qualitative interviews (N=110) aimed at identifying the consumers' main goals conflicting with their attitude toward food waste. Four main conflicts emerged as relevant in consumers' minds: *being a good provider, concerns over possible health risks, healthy diet, and saving money*. We then ran a quantitative study on adult consumers (N=163), aimed at testing an extended Theory of Planned Behavior (TPB) model with the inclusion of such conflicting goals as additional predictors of the consumers' intention to reduce food waste. Both studies were conducted in Italy. Results show that three out of four conflicting goals – *being a good provider, concerns over possible health risks, and healthy diet* – together with *attitude* and *subjective norms*, significantly affect the intention to reduce food waste. In turn, the intention to reduce food waste negatively affects food waste behavior. This study contributes to research on food waste by identifying additional and previously neglected predictors of the intention to reduce food waste. In turn, these results provide evidence of the existence of other valuable entry points to use for the design of successful interventions aimed at reducing household food waste.

**Keywords:** food waste, goals, Theory of Planned Behavior

## 1. Introduction

Food is wasted from “farm to fork”, with edible food discarded at every stage of food production (Eurostat, 2011). Of the 88 million tonnes of food wasted every year in the EU, about 47 million tonnes are wasted at the consumer level (Stenmarck et al., 2016). More specifically, European consumers discard on average 123 kg of food per capita every year (Vanham et al., 2015). However, such staggering estimates are in conflict with consumers’ self-reported negative attitudes toward food waste, and with results from prior research showing that individuals feel bad when wasting food resources (Evans, 2012; Watson and Meah, 2012).

Indeed, prior research has shown that consumers have goals that can inhibit individuals’ intentions not to waste (Evans, 2012; Hebrok and Boks, 2017; Setti et al., 2018; Visschers et al., 2016; Watson and Meah, 2012). For instance, the pursuit of seemingly positive personal goals such as offering an overabundance of food to family members and guests (e.g., Aschemann-Witzel et al., 2015; Graham-Rowe et al., 2014; Schanes et al., 2018; Visschers et al., 2016), or following a healthy diet full of fresh produce (e.g., Conrad et al., 2018), can lead to more food waste. In the same vein, the consequences of protecting the health of oneself and others by avoiding potentially risky foods (e.g., Graham-Rowe et al., 2014; Visschers et al., 2016; Watson and Meah, 2012), of buying in bulk to save money and time so as to devote it to other activities, such as spending the time saved with loved ones (Graham-Rowe et al., 2014; Hoolohan et al., 2018; Maubach et al., 2009), and of consumers’ preferences for varied and new foods (e.g., Hebrok and Boks, 2017; Setti et al., 2018), can have the same effect.

However, while such personal goals have the potential to both contribute to literature on the antecedents of food waste, and help explain consumers’ intentions to reduce waste, there is a lack of research testing the effect of these additional predictors on individuals’ intentions. Indeed, understanding food waste drivers and motivations in terms of factors that affect the intention to reduce food waste either positively or negatively is essential in defining effective policy approaches aimed at reducing food waste (Schmidt and Matthies, 2018; Thyberg and Tonjes, 2016).

In this paper, our primary aim is to show that the inclusion of such personal goals provides a better understanding of intentions to reduce food waste. Specifically, building on recent studies in food waste literature (Graham-Rowe et al., 2015; Russell et al., 2017; Stancu et al., 2016; Stefan et al., 2013; Visschers et al., 2016) our conceptual model is an enriched version of the Theory of Planned Behavior (TPB) model (Ajzen, 1991, 2002, 2015), with goals inhibiting the minimization of food waste, attitude toward food waste, subjective norms, and perceived behavioral control as predictors of the intention to reduce food waste. In turn, intention to reduce food waste is hypothesized to predict food waste behavior. In this sense, our work provides a broader explanation of intentions to reduce food waste, over and above the role played by attitudes, subjective norms and perceived behavioral control.

In the following section, we describe the theoretical framework of our conceptual model and the results of a preliminary study aimed at identifying the main goals inhibiting the intention to reduce food waste – these to be included in our enriched TPB model. Following this, we present our hypotheses and our methodology. Data collection was conducted in Italy. Based on the results of our model we then discuss the implications for research, public policy, and practice. Finally, the limitations of the study are outlined and avenues for further research discussed.

## **2. Theoretical framework**

### *2.1 Theory of Planned Behavior in food waste literature*

TPB (Ajzen, 1991; Ajzen, 2015) has been the main theoretical model used by previous literature to explain food waste behaviors (e.g. Graham-Rowe et al., 2015; Russell et al., 2017; Stancu et al., 2016; Stefan et al., 2013; Visschers et al., 2016). The TPB posits that *intentions* are the main determinants of behaviors. Intentions are in turn predicted by *attitude* toward the behavior, *perceived behavioral control* (PBC) over the behavior, and *subjective norms*. *Attitude* entails the extent to which the individual has a favorable or unfavorable evaluation of the behavior to be enacted (Ajzen, 1991) and in terms of wasting food it has been found to be negative, with consumers feeling bad or guilty about wasting food (Evans, 2012; Watson and Meah, 2012).

84 *Subjective norms* refer to the social pressure that the individual may feel in performing or not  
85 performing a certain behavior (Ajzen, 1991) and are translated into the extent to which people  
86 deemed important by the individual would approve or disapprove of the individual's wasteful  
87 behavior (Graham-Rowe et al., 2015; Stancu et al., 2016; Stefan et al., 2013; Visschers et al., 2016).  
88 Finally, *PBC* refers to the individual's perceived ability to perform the behavior, and thus to the  
89 extent to which the individual perceives the behavior to be easy or difficult to enact and be under  
90 his/her control (Ajzen, 1991). While *attitude* and *subjective norms* are able to predict behaviors that  
91 are under the individual's volitional control, *PBC* was added to the model to account for "*the non-*  
92 *volitional elements inherent, at least potentially, in all behaviors*" (Ajzen, 2002, p. 667). For  
93 instance, individuals may feel that their food waste is caused by factors that are not under their  
94 control, such as package sizes that are so big that the food cannot be consumed before it expires  
95 (Evans, 2012; Williams et al., 2012), or food items bought for a special occasion that never  
96 occurred, or for a specific recipe that ended up not being cooked (Aschemann-Witzel et al., 2015;  
97 Graham-Rowe et al., 2014).

98         While the value of the original formulation of the TPB and its predictive power has been  
99 largely recognized (e.g. Armitage and Conner, 2001), Ajzen (1991) defines the model as being  
100 flexible and "*open to the inclusion of additional predictors*" (p. 199). Indeed, research on food  
101 waste has applied extended versions of the TPB that account for some additional predictors of food  
102 waste behaviors such as *routines* (Stancu et al., 2016; Stefan et al., 2013; Visschers et al., 2016),  
103 *negative emotions* (Graham-Rowe et al., 2015; Russell et al., 2017) and *self-identity* (Graham-Rowe  
104 et al., 2015). In a similar vein, Visschers et al. (2016) show that some personal goals are in conflict  
105 with the negative attitude individuals hold toward food waste, so that while the latter pulls them  
106 toward the minimization of food waste the former pulls them in the opposite direction, leading them  
107 to increase the amount of food they waste. Specifically, such conflicting goals take the form of  
108 *concerns over possible health risks*, in the sense that despite being troubled by the idea of wasting  
109 food individuals consider the avoidance of the perceived health risks associated with consuming

110 leftovers, or products past their expiry dates, to be a priority (Aschemann-Witzel et al., 2015;  
111 Graham-Rowe et al., 2014; Hebrok and Boks, 2017; Schanes et al., 2018; Visschers et al., 2016;  
112 Watson and Meah, 2012). This preference towards avoiding health risks can reach the point where  
113 individuals are even disgusted by the idea of consuming such foods (Aschemann-Witzel et al.,  
114 2015). Furthermore, the attitude toward the minimization of food waste conflicts with individuals  
115 offering plenty of food to people they care about, or to their guests, with the goal of being seen as  
116 *good providers* or *good hosts* (Visschers et al., 2016). Such a goal leads consumers either to offer an  
117 overabundance or a large variety of foods so that the tastes of all members of the household are  
118 satisfied (Aschemann-Witzel et al., 2015; Cappellini and Parsons, 2012; Graham-Rowe et al., 2014;  
119 Schanes et al., 2018), or to overbuy and overcook for social occasions fearing there might not be  
120 enough food for all the guests (Graham-Rowe et al. 2014; Schanes et al., 2018).

121         In this sense, the literature on food waste has shown that whereas some factors positively  
122 affect the intention to reduce food waste (e.g., Graham-Rowe et al., 2015; Russell et al., 2017), the  
123 potential negative effects of other relevant factors have been largely overlooked, with only one  
124 study explicitly investigating this negative effect (Visschers et al., 2016). Thus, building on  
125 Visschers et al. (2016) and on existing research in the food waste literature, the rationale of our  
126 study is to expand our understanding of such conflicting factors, and their potentially significant  
127 role in the prediction of the intention to reduce household food waste, over and above the core TPB  
128 constructs. In order to reach this goal, we have reviewed recent research on food waste to map the  
129 main goals suggested or identified by prior literature as inhibitors of the intention to reduce food  
130 waste. Specifically, we reviewed prior literature with the aim of verifying whether prior research  
131 has suggested or speculated about the existence of other potential conflicting goals besides the ones  
132 explicitly identified by Visschers et al. (2016). We then conducted a preliminary qualitative study  
133 aimed at confirming the results of the literature review and at identifying the personal, conflicting  
134 goals that are deemed most relevant by consumers.

135 Below we present the categories of personal goals able to inhibit the intention to reduce food  
136 waste as identified on the basis of the results of prior research. Next, we present the description and  
137 results of our preliminary study.

## 138 *2.2. Consumers' goals conflicting with their attitude toward food waste*

### 139 *2.2.1. Concerns over possible health risks*

140 Consumers' inability to judge the quality of leftovers meals or the edibility of ingredients  
141 (Farr-Wharton et al., 2014) and the goal of avoiding the potential inconveniences associated with  
142 foodborne illness (Watson and Meah, 2012) conflict with individuals' negative attitudes toward  
143 food waste (e.g., Aschemann- Witzel et al., 2015; Farr-Wharton et al., 2014; Visschers et al., 2016;  
144 Watson and Meah, 2012) and often lead to the premature disposal of food (Aschemann-Witzel et  
145 al., 2015; Farr-Wharton et al., 2014; Graham-Rowe et al., 2014). Evidence from prior research also  
146 suggest this goal to be particularly relevant for consumers who had negative experiences with food  
147 in the past (Farr-Wharton et al., 2014), while in certain circumstances can even prevent individuals  
148 to share food or to accept leftovers from other people (Lazell, 2016).

### 149 *2.2.2 Good provider identity*

150 Despite consumers' negative attitude toward food waste and their desire to reduce it,  
151 consumers often show the desire and pursue the goal of being a "good parent", "good host" or  
152 simply a "good provider" for family members and household guests (Aschemann-Witzel et al.,  
153 2015; Cappellini and Parsons, 2012; Graham-Rowe et al. 2014). This goal is fulfilled by  
154 overpurchasing or overcooking; these behaviors enable the "good provider" to satisfy the taste  
155 preferences and pickiness of both guests and family members and it prevents the potential  
156 embarrassment or guilt associated with not having enough food for everyone (Aschemann-Witzel et  
157 al., 2015; Graham-Rowe et al. 2014; McCarthy and Liu, 2017). At the same time, it leads also to the  
158 use of only certain ingredients and to large amounts of leftovers that are later disposed, leading to  
159 increasing amount of food waste (Graham-Rowe et al., 2014; Cappellini and Parsons, 2012)

### 160 *2.2.3 Saving money*

161 While monetary reasons, such as income constraints, induce consumers to cut down on food  
162 waste, they can also make them more susceptible to over-purchasing discounted and low-quality  
163 foods that later end up being discarded (Setti et al., 2018). For instance, Aschemann-Witzel et al.  
164 (2017) argued that while selling suboptimal products (e.g., products close to their expiry dates or  
165 suboptimal in their appearance) at a lower price may reduce food waste at the retailer's level, it may  
166 increase it at the household level. Furthermore, consumers are attracted by the potential savings and  
167 by the prospect of having food available at all times, or having bulk purchases to fall back on in  
168 case something unexpected occurs (Farr-Wharton et al., 2014; Hebrok and Boks, 2017). However,  
169 overstocking makes it harder for individuals to consume all the foods by their expiration dates or to  
170 eat perishable products (e.g., fresh produce) while still fresh. Furthermore, consumers do not  
171 account for the money they might potentially spend to eat out, whether at restaurants, cafeterias, fast  
172 food joints, or take-aways, when buying in bulks or when deciding to overstock on food (Parizeau  
173 et al., 2015). As a result, initial monetary savings resulting from bulk purchases or lower prices may  
174 ultimately translate into higher levels of food waste later on (Farr-Wharton et al., 2014; Hebrok and  
175 Boks, 2017; Setti et al., 2018).

#### 176 *2.2.4 Healthy diet*

177 The call put out in recent years for healthier lifestyles and for an increase in consumption of  
178 fresh foods (e.g., US Department of Health and Human Services, 2017) is another example of how  
179 potentially positive behaviors – i.e. reduction of food waste and following a healthy diet – can  
180 conflict with each other. Indeed, healthier products such as fruit and vegetables have a shorter shelf  
181 life (Aschemann-Witzel, 2015; Maubach et al., 2009). As a consequence, behaviors enacted in order  
182 to encourage healthy eating such as putting fruit in a bowl on the counter rather than in the fridge  
183 (Hebrok and Boks, 2017), or over-buying healthy and fresh foods to compensate for eating meals  
184 that are perceived as unhealthy (Schanes et al., 2018), end up generating higher levels of household  
185 food waste (Conrad et al., 2018).

#### 186 *2.2.5. Diversified and varied diet*



187 Consumers find it boring to eat the same meal multiple times in a row (Cappellini, 2009),  
188 and prefer to have a large variety of foods always stored in the house (Hebrok and Boks, 2017; Setti  
189 et al., 2018). Both factors can affect the minimization of food waste: the former because individuals  
190 may throw away edible leftovers because they want something new and fresh (Hebrok and Boks,  
191 2017), the latter because unpredictability of appetite and circumstances (Schanes et al., 2018) may  
192 make it difficult for people to consume all the food stored at home while it is still edible. Aiming for  
193 variety in food choices also entails that individuals seek variation by trying new recipes and foods  
194 which may end up being discarded when not meeting their expectations (Aschemann-Witzel et al.,  
195 2015).

#### 196 *2.2.6 Saving time*

197 Time constraints and consequently the goal to save time constitute another factor that may  
198 negatively affect consumers' intentions to minimize food waste (Setti et al., 2018). Indeed,  
199 consumers adopt different strategies in order to save time, namely: stocking up on food so as to save  
200 time on shopping trips and to avoid going shopping if something unplanned happens (Graham-  
201 Rowe et al., 2014); cooking large meals and storing them in the fridge or freezer with the intention  
202 of eating them over several days (Farr-Wharton et al., 2014; Hebrok and Boks, 2017); buying meals  
203 away from home so as to save up the amount of time spent on cooking in order to spend it on other,  
204 more pleasurable, activities such as spending time with friends and family (Graham-Rowe et al.,  
205 2014; Hoolohan et al., 2018; Maubach et al., 2009). Each of these strategies conflicts with  
206 minimization of food waste: respectively, consumers may find it difficult to consume all the food  
207 stored at home; individuals may forget about leftovers or may find it undesirable to eat the same  
208 meal repeatedly, and hence may dispose of it after a while (Farr-Wharton et al., 2014; Hebrok and  
209 Boks, 2017); eating outside entails that the food stored at home, and which would otherwise have  
210 been eaten, may go to waste because of perishability or expiry dates (Hoolohan et al., 2018).

### 211 **3. Preliminary study**

212           Whereas prior literature on food waste provides a first suggestion that goals pursued by  
213 individuals in their everyday life can potentially inhibit their intention to reduce food waste, this  
214 evidence is fragmented and often speculative. Hence, we conducted a qualitative study in order to  
215 provide a broader and more complete overview of these personal goals. Specifically, this study was  
216 aimed at identifying the main conflicts consumers may experience, in relation to their attitude to  
217 minimizing food waste, by prompting them to openly discuss their thoughts and feelings about food  
218 waste and their attitudes toward its reduction. By adopting this exploratory approach, we ensured  
219 that consumers were not “guided” in their responses, and that conflicting goals would simply  
220 emerge from the broader discourse about personal attitudes toward food waste. In this way, we  
221 ensured that the conflicts arising from the interviews were the most prominent ones in the  
222 consumers’ minds, and thus the ones most worthy of investigation. Furthermore, the qualitative  
223 study was aimed at verifying whether the conflicts identified by prior research on food waste would  
224 also consistently emerge from the consumers’ interviews.

225           The interviews were conducted in Italy in March 2016. Master students working on class  
226 projects collected semi-structured interviews from a convenience sample of adults responsible for  
227 shopping and cooking in their household. Each student was asked to recruit and interview 3 people.  
228 Each interviewer asked participants questions about the following topics:

- 229           ● Thoughts and feelings regarding throwing food away (e.g. Tell me about your thoughts and  
230 feelings regarding throwing food away. Why do you throw food away?).
- 231           ● Behaviors regarding reducing food waste (e.g. What do you think are the best or most  
232 effective ways either to avoid wastage altogether, or at least reduce the amount of food that  
233 gets thrown away in the home? Which, if any, of these behaviors do you carry out  
234 yourself?).

235           For the purpose of the present paper we focused our attention on the first part of the  
236 interview and we selected interviews reporting a conflict in consumer attitudes toward food waste.  
237 The total data collection resulted in a sample of 172 adult consumers. The vast majority of

238 individuals held very negative attitudes toward food waste. Among them, 110 (64.2% of the total;  
239 39% male, average age = 45) provided valuable insights reporting specific personal goals not in line  
240 with their general negative attitude toward food wastage. Two master students, familiar with the  
241 topic under investigation, acted as independent coders and categorized the responses, identifying the  
242 personal factors that make individuals experience a conflict in their attitudes toward food waste.  
243 Discrepancies in coding were discussed by the coders in order to reach a resolution. Inter-code  
244 reliability was .84.

### 245 3.1 Results

246 The classification of responses resulted in five main categories: *being a good provider*,  
247 *healthy diet*, *concerns over possible health risks*, *saving money*, and a miscellaneous category (see  
248 *Appendix*). The results of the qualitative study revealed that several types of personal goals are  
249 possible causes of conflict with a negative attitude toward food waste. *Being a good provider*, in  
250 particular, emerged as the most frequently reported factor (37.3%). *Healthy diet* was another  
251 frequently reported personal goal in conflict with a negative orientation toward food waste (28.2%).  
252 Consumers who were health-conscious stated that they tended to purchase a large variety of fresh  
253 foods which frequently were not fully eaten and thus had to be discarded. *Concerns over possible*  
254 *health risks* was the next most frequent response category: 16.4% admitted to throwing away some  
255 food in order to avoid perceived health risks associated with leftovers or food products whose use-  
256 by dates had expired a few days before. *Saving money* was indicated as a cause of conflict with  
257 negative attitude toward food waste by 11.8% of respondents, who reported that promotional offers  
258 and lower unit prices encourage them to buy more than actually needed, with possible effects on  
259 their levels of food waste. In addition, a miscellaneous category contains respondents (6.3%) who  
260 report their need for saving time, or for variety, as personal goals conflicting with the negative  
261 attitude toward food waste.

## 262 4. Hypotheses development

263 Results of the qualitative study showed that four categories of goals – *being a good*  
264 *provider, healthy diet, concerns over possible health risks* and *saving money* – emerge in  
265 consumers’ minds as conflicting with their negative attitude toward food waste. These goals  
266 partially coincide with the six categories of conflicting goals suggested by prior literature. Hence,  
267 we have both support from prior literature and primary qualitative data suggesting that these four  
268 categories are the most relevant for investigation as factors conflicting with the attitude toward food  
269 waste and as additional predictors of the intention to reduce food waste. On the other hand, the  
270 other two categories identified by prior research – *saving time* and *diversified and varied diet* –  
271 were mentioned considerably less in the interviews and thus appear not to be prominent in  
272 consumers’ minds in relation to their planned efforts to reduce food waste. We thus include *being a*  
273 *good provider, healthy diet, concerns over possible health risks* and *saving money* in our TPB  
274 model, which provides the theoretical basis of our analysis.

275 More specifically, the quantitative study is useful for tying together predictions based on  
276 existing research, discussed above, with results of the qualitative interviews, so as to show that the  
277 prediction of an intention to reduce food waste can be improved by the inclusion of additional  
278 predictor variables. Indeed, it is possible that individuals holding a negative perception of food  
279 waste may at the same time pursue intrinsically positive goals that have indirect negative effects on  
280 other aspects of their life.

281 Hence, consistent with the TPB, we expect that attitude, subjective norms, and PBC emerge  
282 as positive predictors of intention. Thus:

283 **H1a.** *Attitude toward food waste reduction has a positive effect on intention to reduce food waste*

284 **H1b.** *Subjective norms have a positive effect on intention to reduce food waste*

285 **H1c.** *Perceived behavioral control has a positive effect on intention to reduce food waste*

286 In line with the TPB, we also expect that intention negatively affects food waste behavior.

287 **H2:** *Intention to reduce food waste has a negative effect on food waste behavior*

288 Finally, considering the additional predictors identified above, we expect that:

289 **H3a:** *The goal of following a healthy diet has a negative effect on intention to reduce food waste*

290 **H3b:** *The goal of saving money has a negative effect on intention to reduce food waste*

291 **H3c:** *The goal of avoiding possible health risks associated with food has a negative effect on*

292 *intention to reduce food waste*

293 **H3d:** *The goal of being a good provider has a negative effect on intention to reduce food waste*

294 **5. Main study: Materials, method, and results**

295 To assess our conceptual model (see Figure 1), a study was conducted with a convenience  
296 sample of Italian consumers. In line with Russell et al. (2017), we developed a two-step data  
297 collection design. In March 2018 (first step), each respondent was asked to first complete a paper-  
298 based questionnaire measuring the relevant variables: the four specific additional predictors  
299 (personal goals) introduced by the present study and the standard TPB constructs. All these  
300 variables were considered to test the hypothesized model, together with the amount of food waste  
301 each respondent recorded in a one-week period (the third week of April 2018; second step of data  
302 collection) as a measure of food waste behavior. We decided to have one-month temporal distance  
303 between the two steps of the data collection (survey and the diary) in order to minimize possible  
304 biases of underestimation of food waste caused by the preliminary survey.

305 In order to obtain the measure of food waste behavior, we asked each respondent to fill in a  
306 one-week, daily-based paper diary collecting information on several different consumption  
307 behaviors (e.g., water consumption, energy consumption, amount of food wasted). As for the  
308 variable of interest for the present study (i.e., food waste), participants were asked to enter all the  
309 food and drinks they throw away as waste during the day using the same materials as in Romani et  
310 al. (2018). The amount of food waste thrown out could be recorded using a number of metrics:  
311 weight, volume or number of items. We asked respondents to weigh items as much as possible  
312 using their available scales. Information from the diaries was inserted manually into an excel  
313 database. All the quantities were converted to weight (grams) during the post analysis of the diaries.

314 *4.1 Participants*

315 Subjects were recruited by 62 Master's students participating in a consumer behavior class  
316 in Italy. Each student recruited 3 respondents; s/he was instructed to recruit people who are the  
317 main ones responsible for food-related decisions in their household. All respondents who explicitly  
318 consented to participate in the research received both a letter explaining the aim of the study and  
319 visits to their home. Twenty-three participants (about 12% of the total) did not deliver the materials  
320 at the end of the project, or delivered incomplete and/or incorrectly completed materials. The final  
321 sample thus included 163 participants<sup>1</sup> responsible for food shopping and cooking in their  
322 household (89% of the total were women<sup>2</sup>; 9.2% aged 18-29, 34.4% aged 30-49, 40.5% aged 50-70,  
323 and 1.8% over 70; 21.1% were undergraduate or higher educated respondents, 61.5% with a high  
324 school education, and 17.4% with a lower level of education; average household member = 3.7, SD  
325 = .72). A small monetary reward was given to respondents who completed the study.

## 326 5.2 Measures

327 In order to achieve a greater participation of subjects and to balance their effort in terms of  
328 tasks to be performed (i.e., each of them had to answer the questionnaire and fill in the diary of food  
329 wasted), we developed a parsimonious questionnaire able to measure the constructs of interest with  
330 a limited number of items. Following TPB guidelines (Ajzen, 1991), respondents' attitudes toward  
331 food waste were measured using two semantic differential items, introduced by "I think engaging in  
332 food waste reduction behaviors is..." (bad/good, negative/positive), on 7-point scales (e.g., 1=very  
333 bad, 7=very good) ( $\rho=.89$ )<sup>3</sup>. Subjective norms regarding food waste were measured using two  
334 items: "If I reduced food waste, people who are important to me would..." (1= completely  
335 disapprove, 7= completely approve), and "Most people who are important to me think that reducing  
336 food waste is..." (1 = very undesirable, 7= very desirable) ( $\rho=.81$ ). *PBC* was measured using two

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<sup>1</sup> In line with Bentler and Chou's (1987) recommendation and supported by recent simulations studies (e.g., Sideridis, Simos, Papanicolaou, and Fletcher, 2014; Wolf, Harrington, Clark, and Miller, 2013), the sample size used is adequate for estimating the hypothesized model; the ratio of cases ( $N$ ) to the number of model parameters ( $q$ ) is higher than 5.

<sup>2</sup> The large number of women in our final sample is in line with the division of labor within the Italian family where women continue to be the ones mainly responsible for food related activities (ISTAT, 2016).

<sup>3</sup> As suggested in literature (Eisinga et al., 2012; Stanley, 1971), we use the Spearman-Brown reliability estimate ( $\rho$  value) for the two-item scales; for the three-item scales we report the Cronbach  $\alpha$  value.

337 items: “How much control are you perceived to have over whether you reduce food waste in your  
338 household?” (1 = very little control, 7 = a great deal of control); “How difficult would it be for you  
339 to reduce food waste in your home?” (1 = very difficult; 7= very easy) ( $\rho = .76$ ). Intention to reduce  
340 food waste was measured using two items: “My intention to reduce food waste in my home in the  
341 next period is...” (1 =very weak, 7= very strong); and “How likely are you to reduce food waste in  
342 your home in the next period?” (1 =very unlikely, 7 =very likely) ( $\rho = .86$ ). Food waste behavior  
343 was measured using the one-week, daily-based paper diary. All the quantities of food waste  
344 recorded by participants were converted to weight (M = 968.25 grams/213,46 pounds; SD = 813.08  
345 grams/179,25 pounds).

346 The four categories of personal goals in conflict with the attitude toward food waste  
347 reduction – *being a good provider*, *healthy diet*, *concerns over possible health risks* and *saving*  
348 *money* – were measured with a multi-item scale partially adapted from previous research (Visschers  
349 et al. 2016) and partially derived from Study 1. In detail, *healthy diet* goals were measured using the  
350 following two items : “I like to have for me and my family very healthy meals, mostly based on  
351 fresh, perishable foods” and “I am very health conscious and as much as possible try to buy fresh  
352 foods regularly” (1 =strongly disagree, 7= strongly agree) ( $\rho = .60$ ). The *saving money* goal was  
353 measured using the following three items: “I believe that buying food in big packages makes it  
354 possible to take advantage of lower unit prices”, “price promotions on foods help me achieve  
355 efficient home management”, and “I appreciate promotional offers on foods because they give me  
356 the opportunity to buy more food for a given amount of money” (1 =strongly disagree, 7= strongly  
357 agree) ( $\alpha = .67$ ). *Concerns over possible health risks* was measured using three items: “I believe  
358 that the risk of becoming ill as a result of eating food past its use-by date is high”, “I believe that  
359 one can’t safely eat food products whose use-by dates expired a few days ago”, and “I am worried  
360 that eating leftovers results in health damage” ( $\alpha = .72$ ); and *being a good provider* using three  
361 items: “It would be embarrassing to me if my guests ate all the food I had prepared for them. They  
362 would probably have liked to eat more”, “I like to provide a large variety of foods at share

mealtimes so that everyone can have something he or she likes”, and “I always have products available to be prepared for unexpected guests or events” ( $\alpha = .65$ ), these variables are adapted from Visschers et al. (2016).

4.3 Results

Before moving on to test hypotheses, measures were validated (see Table 1). The scales had adequate reliability. The dependent variable measuring the total amount of food waste, measured in grams by each respondent, was normalized using a log transformation to reduce biases caused by outliers and satisfy normality assumptions. A confirmatory factor analysis (CFA) on the variables included was run using Lisrel 8.80; the fit of the model was evaluated using the following goodness of fit (GOF) indicators:  $\chi^2$  (df)=155.03 (135),  $p=.11$ ; CFI=0.97; NNFI=0.96; RMSEA=0.03; SRMR=0.05. The GOF indicators of the CFA model were excellent (Bagozzi and Yi, 2012). All factor loadings were high and significant, the average variances extracted (AVE) reached the recommended threshold of 0.50 for each of the dimensions (Hair et al., 2005) (see Table 1) and were higher than the highest squared correlation with any other latent variable (Fornell and Larcker, 1981), suggesting that the measures exhibited convergent and discriminant validity. Given these results<sup>4</sup>, it is appropriate to move on to the tests of our main hypotheses.

In order to test the hypotheses, we ran the TPB enriched model illustrated in Figure 1. We used structural equation modeling (Lisrel 8.80) to conduct the analyses.

	Mean	SD	1	2	3	4	5	6	7	8	9
1. Food waste	6.39 <sup>b</sup>	1.44	--								
2. Intention to reduce food waste	6.08	1.07	-.21**	.87							
3. Attitude	5.19	1.42	-.27**	.39**	.59						
4. PBC	5.75	1.38	-.08	.25**	.05	.51					

<sup>4</sup> Common method Variance (CMV) was also controlled considering the effects of an unmeasured latent methods factor by allowing the items to load on their theoretical constructs and on a latent common methods factor (CMF) (Podsakoff et al., 2003) ( $\chi^2$  (df)=135.29 (116),  $p=.096$ ; CFI=0.98; NNFI=0.96; RMSEA=0.03; SRMR=0.05). The analysis showed that all loadings of the measures on their respective theoretical latent variables remained positive and significant ( $ps<0.001$ ). By contrast, all the loadings on the CMF were not significant, with the exception of three barely significant with loadings much less strong compared to those of the pertinent factors. Therefore, CMV is not a major problem in the model.



5. Subjective norms	6.38	.91	-.11	.21**	.02	.22**	.81			
6. Eating healthy	4.67	1.53	-.02	.04	.15	.15	.12	.52		
7. Saving money	3.76	1.35	-.22**	.12	.14	.14	-.02	.22**	.50	
8. Health risks	2.66	1.44	.05	-.42**	-.49**	-.49**	.07	-.37**	-.17*	.55
9. Good provider	3.55	1.27	.08	-.25**	-.13	-.13	-.05	.05	-.12	.09
										.50

<sup>a</sup> AVE values are on the diagonal. <sup>b</sup> The non-normalized value for food waste is M = 968.25 grams/213,46 pounds (SD = 813.08

grams/179,25 pounds). Asterisks indicate the following: \*p < 0.05, \*\*p < 0.01.

**Table 1: Means, Standard Deviations, and Correlations<sup>a</sup>**

The enriched TPB model (see Figure 1) showed an excellent fit (Bagozzi and Yi, 2012):

$\chi^2(df) = 175.92 (141)$ ,  $p = .03$ ; CFI = .96; NNFI = .95; RMSEA = .04; SRMR = .06. The results

show that attitude ( $b = .41$ ;  $t = 4.69$ ) and subjective norms ( $b = .14$ ;  $t = 1.97$ ) were significant

predictors of intention to reduce food waste behavior, supporting H1a and H1b, whereas the

hypothesized relationship between PBC and intention to reduce food waste (H1c) was not supported

( $b = .09$ ;  $t = .76$ ). The additional variables considered in these analyses play a role in affecting the

consumer's intention to reduce food waste. In detail, three out of four personal goals, in conflict

with the attitude toward food waste reduction, negatively affect intention: *healthy diet* ( $b = -.42$ ;  $t =$

$-2.29$ ); *concerns over possible health risks* ( $b = -.48$ ;  $t = -2.32$ ); and *being a good provider* ( $b = -.24$ ;

$t = -2.17$ ), supporting H3a, H3c, and H3d, respectively. Conversely, *saving money* does not affect

the intention to reduce food waste ( $b = -.03$ ;  $t = -.36$ ), thus H3b is not supported. Finally, results

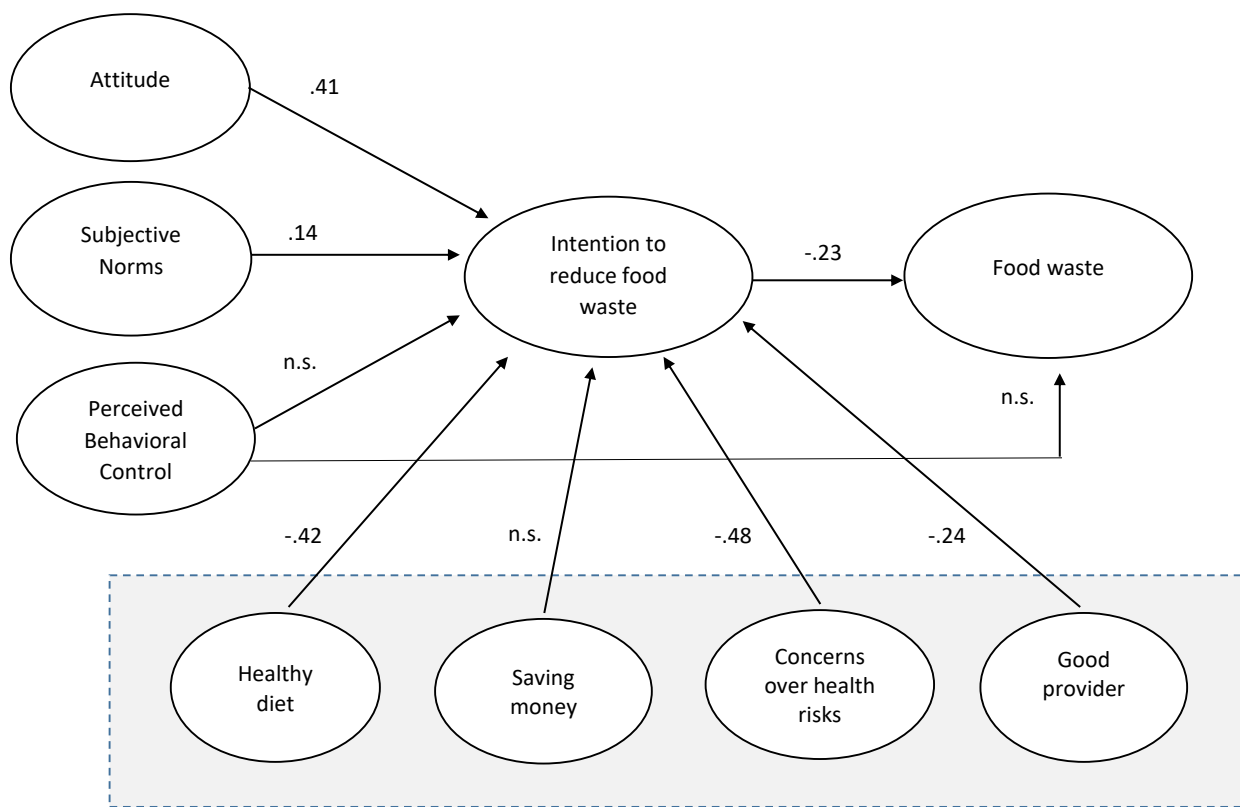
show that intention to reduce food waste negatively affects ( $b = -.23$ ;  $t = -2.76$ ) the food waste

behavior of our respondents. H2 is thus supported. In accordance with the TPB model, we also

considered the direct relationship between PBC and the food waste behavior that resulted as not

significant ( $b = .01$ ;  $t = .05$ ). Results are shown in Figure 1. The amount of variance in intention to

401 reduce food waste accounted for by the model is 56%<sup>5</sup>.



402  
403 **Figure 1:** The hypothesized model and results

404  
405 **5. Discussion and conclusion**

406 We found that intention to reduce food waste is predicted by attitudes individuals hold  
407 toward food waste reduction and that individuals who believe that important people in their lives  
408 would appreciate their efforts to reduce food waste have a stronger intention to reduce food waste.  
409 By contrast, individual perceptions about the level of control over the amount of food wasted seems  
410 not to affect the intention to reduce food waste. Furthermore, individuals who have a higher  
411 intention to reduce food waste report lower levels of waste. Finally, the results show that the

<sup>5</sup> The comparison between the classic TPB model ( $\chi^2(df)= 28.27 (20)$ ,  $p = .11$ ; CFI = .99; NNFI = .98; RMSEA = .05; SRMR = .05) and the enriched one showed a substantial increase in the amount of variance in intention to reduce food waste accounted for by the model (32% for original TPB model explained vs. 56% for the enriched TPB model). ECVI and AIC indexes of the enriched TPB model (ECVI=1.94, AIC=313.92) are lower compared to the same indexes pertaining to the alternative classic model (ECVI=2.34, AIC=374.35), reinforcing the usefulness of the inclusion of the personal goals.

412 addition of the goal to follow a healthy diet full of fresh, perishable products, the goal of avoiding  
413 possible health risks associated with food consumption and the goal of being a good provider  
414 predict intentions to reduce food waste. Conversely, the goal of saving money that leads to  
415 behaviors that may favor waste does not predict intentions to reduce food waste.

416 From a theoretical standpoint, the results of the present study add to the literature on food  
417 waste showing that the prediction of intention to reduce food waste is strengthened by the inclusion  
418 of additional variables other than the ones originally considered in the TPB (e.g., Graham-Rowe et  
419 al., 2015; Russell et al., 2017; Stancu et al., 2016; Stefan et al., 2013; Visschers et al., 2016).

420 Specifically, our study shows that while focusing on attitude is warranted, other personal goals that  
421 shape individuals' decisions in their everyday life should be accounted for when trying to predict  
422 intention to reduce food waste. By taking into specific consideration the different effects of both the  
423 consumer's negative attitude toward wasteful behaviors and his personal goals, a more complete  
424 picture of the mental processes behind the intention to reduce food waste can be obtained. In this  
425 sense, we extend results by Visschers et al. (2016) by showing that the goal of following a healthy  
426 diet as well as concerns over possible health risks and being a good provider significantly affect the  
427 intention to reduce food waste. Conversely, the goal of saving money does not predict an intention  
428 to reduce food waste. One possible explanation is that consumers underestimate the extent to which  
429 they engage in such shopping behaviors. This potential underreporting of the behaviors enacted in  
430 order to save money may have reduced the effect that this variable has on their intention to reduce  
431 food waste, leading to insignificant results. On the other hand, an alternative explanation could be  
432 that food is perceived as taking up only a small fraction of disposable income; as a result, the saving  
433 opportunities associated with these expenses are deemed limited and thus negligible by consumers.  
434 As a result, consumers underestimate the role played by saving money when doing their grocery  
435 shopping thus leading to a non-significant result of the goal of saving money on intention to reduce  
436 food waste.

437           The findings of the present study provide useful suggestions for initiatives aimed at the  
438 minimization of household food waste. In particular, the significant role played by personal goals  
439 for being a good provider, for avoiding health risks, and for following a healthy diet show that  
440 interventions aimed at reducing food waste could potentially be successful by targeting behaviors  
441 that are apparently unrelated to the generation of food waste. For instance, food waste awareness  
442 campaigns could focus on a new meaning of *good provider*, by showing that being a good provider  
443 for one's family entails ensuring a world free of waste for future generations as well as providing  
444 good and abundant food for the people one cares about. On the other hand, more knowledge about  
445 the actual risks associated with the consumption of leftovers or of products close to or past their  
446 expiry dates could significantly increase consumers' intentions to reduce food waste. In this sense,  
447 supermarkets such as WeFood in Denmark (<https://www.danchurchaid.org/join-us/wefood>) or  
448 retailers such as East of England Coop (<https://www.eastofengland.coop/>) selling products past their  
449 best-before dates are showing that the consumption of products that are usually deemed suboptimal  
450 (Aschemann-Witzel et al., 2015), unworthy, or risky does not entail any threat for the consumer's  
451 own health or that of the people s/he cares about. Moreover, websites such as SuperCook  
452 (<https://www.supercook.com/#/recipes>) or BigOven (<https://www.bigoven.com/>) help consumers  
453 make good use of their leftovers or of their overabundance of fresh, highly perishable products by  
454 suggesting potential recipes to cook with the ingredients they already have available at home. Other  
455 examples are famous chefs promoting the use of suboptimal products and showing consumers that  
456 they are safe to consume. This is, for instance, the case of Jamie Oliver promoting the consumption  
457 of aesthetically imperfect fruits and vegetables (Smithers, 2015). Such initiatives aimed at providing  
458 consumers with the tools to reduce their household food waste could be similarly adopted, both at  
459 the public policy level and by retailers, by providing citizens or consumers with more information  
460 about how to efficiently use their food inventories. These could range from recipe booklets to  
461 websites or apps acting as intermediaries between consumers willing to donate their surplus of food,  
462 and charities that would distribute it to those in need.

463           Whereas initiatives aimed at educating consumers can be useful in terms of both public  
464 policy and retail initiatives directed at reducing food waste, their impact has been shown to be only  
465 limited when evaluated in relation to actual behavioral change (e.g., Cappellini and Pearson, 2012;  
466 Hebrok and Heidenstrøm, 2019; Richetin et al., 2012; Watson and Meah, 2012). More specifically,  
467 recent research has put out a call for the definition of interventions that account for the way food is  
468 handled and used rather than the way in which it is acquired and disposed of (e.g. Hebrok and  
469 Heidenstrøm, 2019; Stöckli et al., 2018). Our results are in line with this approach, as they show  
470 that everyday goals – which are translated into everyday practices – affect consumers’ intention to  
471 reduce food waste. In this sense, different agents could develop interventions with the aim of  
472 reducing the conflict between these consumers’ goals and attitude toward food waste. For instance,  
473 companies could offer small packages for produce, so that it would be easier for consumers to both  
474 follow a healthy diet and reduce food waste. In a similar vein, companies could design packages  
475 with instructions about how to store food when it is close to the expiration date (e.g. freeze it before  
476 it expires) or when produce is starting to spoil (e.g. cutting fruits and vegetables into pieces and  
477 freezing them for later use in smoothies or shakes). By doing so, companies would potentially  
478 prevent the emergence of strong health concerns about food whose quality consumers may find  
479 difficult to assess. Other solutions include smart fridges that track the expiration dates of food  
480 (Eadicicco, 2016) or other smart objects (e.g., voice assistants such as Alexa or Google Home) that  
481 could help in reducing the conflicts between personal goals and attitudes toward food waste.

482           While hypotheses were supported and recommendations were drawn, this study has  
483 limitations that need to be addressed. The main limitation of our study refers to self-reported  
484 measures. More specifically, consumers may report higher intentions to reduce food waste because  
485 of response bias due to social desirability. In particular, while a daily-based diary is a more reliable  
486 measure than asking respondents about their food waste on a general level, it can still be subject to  
487 inaccuracy and social desirability bias (Xue et al., 2017). Acknowledging this issue, we run specific  
488 analysis (i.e., CMV) to check for possible social desirability bias. Future research can further

489 address this problem (e.g., by collecting specific data on the social desirability tendency of  
490 respondents and checking for this in the analysis). Moreover, it needs to be mentioned that  
491 observable higher levels of food waste would strengthen our conclusions about the effect of  
492 intentions on behavior rather than weaken them. Therefore, future research could then use more  
493 objective measures of food waste behaviors to avoid inaccuracies and ensure reliability of results.  
494 Furthermore, this study used convenience samples (although with adult consumers responsible for  
495 shopping and cooking) and future studies may consider samples representative of the general  
496 population in order to strengthen their findings. Finally, this study was intended to provide a  
497 foundation for launching additional research on the key role of personal goals in conflict with  
498 negative attitude toward food waste and their effects on food waste behaviors. The evidence here  
499 illustrated provides a basis for future studies to empirically assess how these personal goals can be  
500 managed to reduce food waste. Specifically, in addition to the direct effects of personal goals on the  
501 intention to reduce food waste, it would be interesting to investigate whether these goals are able to  
502 moderate the effect of attitude on intention. For example, comparing consumers who have the goal  
503 of healthy eating with those who do not share this goal might show interesting different effects on  
504 the relationship between the attitude toward food waste and the intention to reduce it that could be  
505 worth investigating.

506 In conclusion, our research shows that accounting for antecedents that indirectly affect food  
507 waste – and as such they might go unnoticed – attitude is essential for the achievement of food  
508 waste reduction goals. We believe such a broader perspective to be both theoretically relevant and  
509 warranted for the design of successful managerial and public policy initiatives aimed at mitigating  
510 food waste.

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Category	% of respondents	Qualitative comments
Being a good provider	37.3	<p><i>Last Sunday we had a guest for lunch and we cooked more pasta than we needed, and so we had some leftovers. Given that we had a guest I honestly thought “better to have more than less food”. However, it was avoidable as we also had other foods to eat (F, 21)</i></p> <p><i>Yesterday I wasted both my first and second course. Maybe I cooked more than necessary, but this is because my family is unpredictable: one day they eat way too much, another day way too little, and so it is virtually impossible to predict their food behaviors. It is impossible to make a good host, especially in a big family in which you find out last minute who’s going to eat at home and what are everybody’s preferences for the day. And I want to be a good provider and so I end up wasting food. (F, 50).</i></p>
Healthy diet	28.2	<p><i>It often happens with yogurts. I force myself to eat them because they are good for my health, but I end up not eating them either because I don’t feel like it or because I forget about having them in the fridge. (F, 60)</i></p> <p><i>I usually discard dairy products, fruits and vegetables. I often buy too much of these products to avoid not having them at home or fearing I might end up not eating properly, but sometimes I am forced to throw them away because they had expired and I didn’t manage to use them in time. (F, 26)</i></p>
Concerns over possible health risks	16.4	<p><i>I recently trashed a barely used mayonnaise bottle; it wasn’t either empty or expired, but it had a bad taste. I don’t want to catch salmonellosis, even if I feel guilty. (M, 30)</i></p> <p><i>I realized yogurts in the fridge expired a week ago. I don’t like to take my chances with dairy; had they been expired only for a few days I might have tried them and then decided what to do with them. However, I thought that a week was too much time and I feared I might get sick. I’m sorry about wasting, but in these cases there is no choice. Way too risky! (F, 49)</i></p>
Saving money	11.8	<p><i>I have bought a large box of fruits and vegetables (even 15kg boxes) at the farmers’ market in order to pay a lower price. It can happen that I might not be able to use all the produce. Some of it may go bad and I’m forced to throw it away with great regret. (M, 49)</i></p> <p><i>I am susceptible to promotions. It’s beyond me. I always think about how to get a good deal. Often I realize that I have food that I cannot consume and that I have to throw away. Every time I really regret it, but I always end up doing it again. (M, 45)</i></p>
Miscellaneous (taste and variety preference; need to experiment with new food; saving time)	6.3	<p><i>I tend to waste when I try to experiment with new recipes that end up being real failures. I can’t serve those dishes. (F, 52)</i></p> <p><i>I often waste when I make weekly shopping expeditions in order to save time. It’s rare but it can happen. Too many products not easy to consume in time. (F, 45)</i></p>

648 Note: Quotes in table are attributed to interviewees in the form (gender: F or M, age).