

Article

Motivations and Actions to Prevent Food Waste among Young Italian Consumers

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Abstract: Food waste is a relevant global problem due to its consequences on food security, economy, and environmental sustainability. This study focuses, in detail, on finding the main motivation for food waste among the young and the principal actions to prevent it. The paper focuses on Italian reality, since Western countries are partly accountable for wasting large amounts of food. What is more, the focus has been shifted specifically on to the youths and young adults, as they are the portion of the population that are most inclined to waste food. Data were collected using a questionnaire survey performed on a sample of $n = 904$ Italian consumers. In line with previous research, the results of this study confirm that avoidable food waste comes from three main behavioural antecedents: over preparation, excessive purchase, and inappropriate conservation. The research shows that food waste cannot be reduced by just one-way from the consumers; rather, it goes both ways, between consumers and retailers. Therefore, only holding the consumers accountable and expecting them to solve it will not solve the problem of food waste; marketing and retailers should also consider ethics when it comes to food distribution.

Keywords: food waste; young consumers; food habits; food behaviour

1. Introduction

Food waste is a relevant global problem. Approximately 1.3 billion tonnes of food are wasted per year [1]. The European Union, alone is responsible for 89 million tonnes per year of food waste, with associated costs being estimated at 143 billion euros [2]. In addition to such a high amount of food wastage, the rising population and shifting patterns of food consumption also exacerbate the condition of global food supply [3,4].

Measures to reduce food waste have been continuously established over the years due to the damage and potential future risks food waste poses; the European Commission [5] had targeted to cut down the food waste generation by one half by 2020 and the United Nations proposed their aims of halving the per-capita global food waste along the production chain by 2030 [6] (p. 27).

However, the food waste problem is yet to be solved. Bräutigam et al. [7] indicate the lack of concordance of results when it comes to the calculation of EU-27's data on food waste. This puts the validity of the available food waste data into question, and suggests that there is a difficulty in collecting data regarding food waste. Assessing and quantifying food waste is difficult due to the numerous definitions of the term “food waste”, to which there is no global agreement upon [8,9]. The definitions diverge when it comes to the terminology used, criteria considered, perspectives adopted, and the type of food waste considered [10]. In this research, the term food waste is considered as “any food discarded during preparation in the home, in restaurants, bars or canteens” [11], and following the lines of the Food and Agriculture Organization (FAO), this term is used only in relation to the distribution and consumption stages [1,10].

One of the largest driving forces in food waste is the consumer. Generally, food is lost and/or wasted throughout the food chain, from primary production to final household consumption [7]. Low-income countries experience more food loss during the early stages of the supply chain due to limited harvesting techniques and inadequate storing facilities [12], while medium- and high-income countries, experience food losses at the later stages of the supply chain that result from consumer behaviour, since people can simply afford to waste food [13].

The fact that people are in a position where they can afford to waste food, raises the food waste problem to an ethical level. One-third of the globally produced food is wasted [14], while at least 805 million people are food insecure [15], and approximately one billion suffer from malnutrition [16]. This highlights the importance of assessing the group of people who can afford wasting food, in order to further understand the causes of food waste and ways to reduce it.

The paper focuses on Italian reality, since Western countries are partly accountable for wasting large amounts of food [17], especially in industrialised countries rather than in developing ones. What is more, the focus has been specifically shifted to the youths and young adults, focusing in detail on the “Millennials” generation, that is the generation of those born between the years 1982 and 2004. They represent the first generation that has grown in the new millennium and they are a crucial market segment for current and future business [18,19], as they are the portion of the population that are most inclined to waste food [20]. Understanding their behaviour would lead to the development of interventions that entail the specific needs of different groups, when considering that they require different approaches [21].

Therefore, the research questions (RQ), which the paper investigates, are the following:

RQ1: which is the main food behaviour of the young Italians and which type of foods do they waste most?

RQ2: which are the main motivations for food waste among young consumers? And which are the actions they do to prevent food waste?

RQ3: how can young Italian consumers' behaviour in relation to Food Waste be clustered?

RQ4: which elements influence in a positive or in a negative way the probability of having a food waste behaviour by young consumers?

This study tries to follow the line of research that was defined by Mondéjar-Jiménez et al. [20] Mallison et al. [22], and Painter et al. [23], focusing in detail on finding the main motivation for food waste among the young and the principal actions to prevent food waste.

The paper is divided, as follows: Section 2 defines the theoretical framework, Section 3 presents the research design, and Section 4 describes the main results obtained. Subsequently, Section 5 is used to discuss the theoretical contribution of the paper, the managerial implications derived from, drawing the conclusions, the main limitations, and future research directions.

2. Literature Review

2.1. The Food-Wasting “Millennials”

Age is a factor that affects food waste, with young people wasting more than older people [9,24]. Food waste falls greatly as age increases; in Australia, 38% of 18–24 year olds wasted more than \$30(AUD) on food over two weeks, in comparison to 7% of 70-year-olds and up [25]. Similarly, in the United Kingdom (UK), people over the age of 65 wasted significantly less food when compared to the rest of the population [9]. However, the claims that all youths and young adults waste food would be fallacious, and it would be wrong to assume that all members of this age group are to be held accountable. Mondéjar-Jiménez et al.'s. [20] study explored food waste behaviours in Italian and Spanish youths. The Italian and Spanish food selection highly adhere to the Mediterranean Diet, which is a dietary pattern that is recognized as environmentally-sustainable and entails a high consumption of perishable products (e.g., fish, fruits, and vegetables). The key factor in such a diet

is that purchases must be planned correctly, stored, or immediately consumed to avoid generating waste. Upon investigating Italian and Spanish students, it was revealed that 59% of Italian youths' households wasted 15% or less of edible food, while 63% of Spanish youths declared to waste 15% or less of the food that they purchase per week [20]. Only 1.7% of Italian youths declared that they wasted more than 30% of food and 2% of Spanish youths declared they waste more than 30% of their food [20]. Moreover, there is the indication that more Italian youths are aware of food waste, and that they are more likely to reduce food waste [26], suggesting that food waste is more consciously prevented as compared to other countries, and that awareness is key. In fact, it is regarded that a greater awareness of the consequences of food waste increases the likelihood that youths exhibit behaviour that leads to a reduction in food waste (i.e., make a shopping list) [26].

However, the diet style and awareness may not be the only key factors in reducing food waste.

2.2. Youth's Behaviour in Food Waste and the Proposed Solutions

2.2.1. Motivations to Food Waste

Extant literature on the main motivations that affect Food Waste is limited and fragmented, since it focuses on single or few variables, sometimes assuming behavioural and other times socio-demographic perspectives [27–29].

Vermeir and Verbeke [30] found that everyday purchasing and consumption practices are heavily motivated by a variety of influences, such as convenience, habitual behaviour, diet and health concerns, perceived value for money, hedonism/ lifestyle, and social responsibility as perceived through social norms. Factors that influence food behaviours include social norms, attitudes, cultural upbringing, experience, knowledge, and understanding of food [31].

A lack of knowledge appears to be one of the drivers in food waste behaviour; in the European Union alone, only one-third of the consumers had the ability to comprehend the meaning of the 'Best before' date [32].

However, avoidable food waste also comes from the following identified behavioural antecedents: excessive purchase, over preparation, and inappropriate conservation. Marketing and sales strategies that are promoted by food companies have a direct and significantly negative effect on consumer behaviour [20,26], pushing them to develop actions of excessive purchase. Offers, promotions, and the layout of goods in supermarkets can strongly influence food waste generations; thus, interventions or initiatives that are solely directed at consumers cannot be effective in reducing food waste. This further suggests that food waste occurs at the consumer level and that retailers are key in preventing the generation of food waste [20].

As for over preparation, the irrational growth of food portions is documented in the literature as contributing heavily to household food waste volumes [33,34]. One way of counteracting it is to consume the household leftovers, which is necessary to help save money and reduce food waste [20]. This is often a cause of waste, since the leftovers are sometimes forgotten or not re-used within a short time [33,35]. Younger people may struggle with this as compared to older people, as older people are more skilled and experienced to use leftovers and foods that are approaching their use-by date safely [17,36]. Moreover, older people are more ethically considerate towards wasting food, as their negative perception of wasting food stems from experiencing food insecurity during World War II [35].

Also, inappropriate conservation is a relevant factor that affects motivations to waste food, since, as found by Farr-Wharton et al. [33], most consumers fail in storing food, as they tend to place food products according to a random and non-systematic approach, which results in food that expires before being relocated.

2.2.2. Actions to Prevent Food Waste

Food prevention has the potential to deliver substantial environmental, social, and economic benefits [37]. However, the issue of food prevention has only recently been investigated by the literature and it needs further analyses to be widely understood [35,38].

Recent studies [39,40] highlighted how a growing number of young consumers have considerably changed their behaviour in the last two decades since the demand of healthy, nutritious, convenient, and safe food has gradually improved among them. Young people are increasingly asking for additional food safety and health education [41]. However, Vermeir and Verbeke [30] argue that increases in consumer interest and attitudes towards sustainable food practices do not necessarily trigger a change in consumer behaviour. Although consumers may have an interest in sustainable food practices, external factors may prevent them from performing and sustaining such practices. In other words, consumers are not able to implement behaviours that are consistent with their goals [42].

The temptation to opt for behaviours that lead to food waste may not only be internalized routines and behaviours, but also outside factors that feed into such behaviours, such as marketing and advertisements.

However, focusing on the young segment of consumers, research studies [20,43–45] found three main positive activities towards reducing food waste, that is, consuming household leftovers, understanding the date-labels on food, and planning food purchases. Leftovers are recognized as one of the main reason for discarding food [45,46], because of the planning skills that are needed to reuse them but also due to psychological contamination bias or simply because they want to show others that they can always afford to eat fresh food [47]. Quested et al. [35], for instance, demonstrated that providing ideas for improving the abilities of consumers in cooking and freezing could help them to properly reuse leftovers. In any case, the literature identifies, among the actions that should be carried out before the reuse of leftovers, those that are related to a correct planning of food purchases, found to be a positive behaviour in reducing food waste [48,49]. Naturally, a proper purchase planning must be accompanied by a correct understanding that the “best before” date is related to quality, while the “use by” date is related to safety, certainly could help consumers to make choices that are more informed [50].

3. Methodology

3.1. Sampling Design

Data were collected using a structured questionnaire survey that was distributed via computer-assisted web interviewing (CAWI). The decision to use the CAWI methodology was taken since the study focuses on young consumers and the literature has found that “younger people have a stronger preference of joining the CAWI survey” [51] (p. 303). The CAWI methodology leads to the creation of a self-selected sample, and therefore this could lead to a self-selection bias.

The survey began October 15th, 2017 and the answers were accepted until December 15th, 2017. All of the correct answers received in this period have been used as a reference sample. In detail, 1025 answers to the survey have been received, but 121 of them were discarded due to the incompleteness of the data collected, therefore the final sample consists of 904 Italian consumers. It has been decided to focus on the Millennial generation of consumers, not interviewing minors but to have only consumers of age to take part to the survey, since they could knowingly give the authorization to use the data that were obtained. Therefore, only consumers between 18 and 35 years have been interviewed. The questionnaire was divided into two sections (see Appendix B): the first section was aimed at analyzing the socio-demographic data and the eating habits of interviewees: consumers were asked about the places where they more frequently buy food products, how often they eat at home and away from home, and what their main eating habits are. The second part of the survey was focused on waste behaviours, both in terms of attitudes and individual awareness of one’s actions and consequences. In detail, it was investigated the frequency of consumers in throwing away food that is still edible,

their frequency of re-use of leftovers, trying to understand which foods are most often thrown away and which ones are reused. Furthermore, the study has investigated the reasons as to why consumers waste food and what actions they put into practice to try to reduce waste. Finally, the survey tried to understand how consumers manage expired food, how they dispose of it and when, and if they even use it after the expiry date. The data have not been collected through a diary, so the results of this study represent perceptions of the respondents.

3.2. Measures

The aim of the research was to develop an exploratory analysis [52] using an inductive research approach [53], to analyze young consumers behaviour towards food waste. To describe the sample profile, descriptive analysis was performed. A five-point Semantic scale has been used to evaluate the questionnaire items concerning the reasons for food waste and waste prevention. To verify the reliability of the Semantic scale analysis, Cronbach's alpha values were computed, taking into account only alpha values that are greater than 0.60, as suggested by Nunnally and Bernstein [54]. The reliability of the items has been calculated as a set of variables and not as a single value for each item [55]. A Principal Component Analysis (PCA), followed by Oblimin rotation [56], was applied as a data reduction method to factors related to the types of food wasted most, the main motivations to food waste, and the principal actions to prevent food waste. (Table A3, Table A4, and Table A5 in Appendix A show the descriptive statistics of the factors used for the PCA). It has been decided to use Oblimin rotation, since little correlation among the items was found, and while using Oblimin, the solution factors are allowed to be correlated [57]. Variables with factor loadings that were less than 0.6 were dropped from the further analysis because these are not considered to be statistically significant. As for the cumulative variance considered, in the social sciences, where information is often less precise, it is common to consider a solution that accounts for 60% and even less of the total variance as satisfactory [58].

A two-step cluster analysis was made to identify the differences among consumers in terms of food waste behaviour. The original variables and not the PCA rotated factors was used in the clustering procedure, since it has been decided to use not all the same variables of the PCA, but those variables that allowed the explanation of the clusters that were obtained as best as possible. Two-Step Cluster is an algorithm that is primarily designed to analyze large datasets ($n > 200$), since Hierarchical and K-means clustering do not scale efficiently [59,60]. Two-Step enables both continuous and categorical attributes and it has its application when there are categorical variables with three or more categories [61]. The method is based on a probabilistic approach, in which the clustering algorithm uses a likelihood distance measure as the similarity criterion and the best number of clusters is chosen on the basis of Schwarz's Bayesian Information Criterion (BIC). The Two-Step Clustering Analysis (TSCA) has been chosen because it has shown superior performance when compared to classical clustering approaches, such as K-Means Clustering (KMCA) and traditional clustering based on hierarchical agglomerative techniques (HCA), as it was specifically developed to correct the methodological limitations of two prior algorithms [59,60]. An advantage of TSCA is the ease of use because of the guidance in defining the number of clusters. This method provides a built-in procedure, which is based on BIC or Akaike's Information Criterion (AIC) to determine the optimum number of clusters and it provides simple visual methods to assess the results. Determining the optimum number of clusters is determined by the researcher's subjective judgment in the classical segmentation approach based on HCA. In the case of KMCA, instead, it is basically an arbitrary choice and many researchers actually use KMCA following a preliminary analysis based on HCA, which is typically based on Ward's method (Ward 1963), for the purpose of guessing the number of clusters and defining the initial cluster centres from where the k-means clustering algorithm should start the computation process [62] (p. 1145). Validity is assessed based on a combination of two measures: 1) cohesion that is the proximity among members of the same cluster (the higher, the better); and, 2) separation that is the proximity among members or centroids of different clusters (the lower, the better) [62] (p. 1146).

Finally, to assess which elements influence, in a positive or in a negative way, the probability of having a food waste behaviour by consumers, a binary regression [63] was used. The binary regression equation is estimated, as follows.

$$\begin{aligned} \text{Pr (Food Waste Behaviour=yes)} = \text{logit} (\beta_0 + \beta_1 \text{Dummy_Age} + \beta_2 \text{Mot1} + \beta_3 \text{Mot2} + \beta_4 \text{Mot3} + \\ \beta_5 \text{Mot4} + \beta_6 \text{Mot5} + \beta_7 \text{Mot6} + \beta_8 \text{Act1} + \beta_9 \text{Act2} + \beta_{10} \text{Act3} + \beta_{11} \text{Act4} + \beta_{12} \text{Act5} + \beta_{13} \text{Act6} + \\ \beta_{14} \text{Act7} + \varepsilon) \end{aligned} \quad (1)$$

where:

Food Waste Behaviour is a dummy variable that is 1 if the mean value of Food Waste for each consumer is ≥ 2 point of the Semantic scale (regardless of the level that is declared by single consumer), otherwise zero (which corresponds to value 1 of the Semantic scale assumed to be as “not at all” Food Waste). This variable was created by averaging the answers to the questionnaire question “In your family, how often do you throw away still edible food?”, to which each respondent had to respond with a value of the Semantic Scale from 1–5 for each food item considered (fruits and vegetables, pasta/rice, bread, biscuits, meat, fish, milk and eggs, ready meals, sauces, beverages). A dummy variable was created, since the Y variable should be a yes/no or 0/1 variable [64,65].

Dummy_Age is the dummy variable that was created for the variable age. This variable has been turned into a dummy variable, since it is a categorical variable, and in every regression procedure in every stat software, the default way to code categorical variables is with dummy coding. Dummy coding allows for turning categories into something that a regression can treat as having a high (1) and low (0) score. Any binary variable can be thought of as having directionality because if it is higher, it is category 1, but if it is lower, then it is category 0. This allows the regression look at directionality by comparing two sides, rather than expecting each unit to correspond with some kind of increase [64,65].

From variable Mot1 to variable Mot6 are the motivations to Food Waste, as assessed by a Semantic scale from 1 to 5.

From variable Act1 to variable Act 7 are the actions to prevent Food Waste, as assessed by a Semantic scale from 1 to 5.

Tests for evaluating the goodness of fit of the model were performed with acceptable results [63] (Omnibus test: P-value < 0.01; Nagelkerke R Square: 0.434; Hosmer and Lemeshow test: P-value > 0.05).

All data were processed using SPSS 23.0 statistical software package.

4. Results

4.1. Consumers' Food and Waste Behaviour

As for the socio-demographic features of the sample, the respondents are mainly between 22 and 30 years old (73.01%), they have in majority a good level of education that range from High School Diploma (48.01%) to Bachelor Degree (33.30%), and most of them are still students (74.00%) (see Table A1 in Appendix A).

When analyzing food habits of young consumers in relation to the consumption of healthy and unhealthy foods (see Table A2 in Appendix A), it can be seen that vegetables (3.990), followed by pasta (3.887) and fruits (3.707), are among the most consumed healthy foods. As regards the consumption of fat and unhealthy food products, this does not exceed, in any case, the threshold of indifference (value 3 of the Semantic scale), underlining an infrequent use by young consumers. In any case, among the most unhealthy foods consumed, there are brioche and sweets (2.980), cured meat (2.889), and snacks (2.574).

When considering the leftovers of food on the table, among those that are most reused by young people to create other dishes or to be heated and put on the table again, there are bread (3.575), pasta and rice (3.487), fruit and vegetables (3.258), and meat (3.227). Ready meals are among the most frequently thrown meals (2.302) once opened, followed by sauces (2.535), and then beverages (2.565) (see Table 1).

Table 1. Food leftovers used to create other food or heated and reserved on the table.

	N	Mean	Std. Deviation	Std. Error
Fruits and vegetables	904	3.258	1.3349	0.0445
Pasta/rice	904	3.487	1.1806	0.0394
Bread	904	3.575	1.2235	0.0408
Biscuits	904	2.789	1.4818	0.0496
Meat	904	3.227	1.3264	0.0442
Fish	904	2.878	1.4408	0.0482
Milk and eggs	904	2.891	1.4139	0.0472
Ready meals	904	2.302	1.4364	0.0480
Sauces	904	2.535	1.4565	0.0487
Beverages	904	2.565	1.5622	0.0522
<i>Cronbach's Alpha</i>		0.923		

The greatest amount of waste comes from products that are gone bad (mean = 3.374; Std. Deviation = 1.4003) before being cooked, but to a lesser extent this also derives from leftovers preserved and no longer consumed (mean = 2.707; Std. Deviation = 1.2407) and from advanced food in the dish after the meal (mean = 2.405; Std. Deviation = 1.3745).

Performing a PCA on the type of meal wasted most (see Table 2), three main variables arise. The first in terms of cumulative variance (75.38%) is called Unfinished Products and it is related to products that are opened and used, but are then not finished. The second component (cumulative variance 60.52%) is called Not Opened Food, and it is related to food that is thrown away without being even opened. This could be related to the excessive purchase of food or to a frenetic pace of life that leads not having meals at home and therefore not being able to consume food before the expiration date. The third component (cumulative variance 44.36%) is called Discarded Food and it concerns food that is discarded, because it has gone bad or because it is not reused after the meal.

Table 2. Principal Component Analysis (PCA) on type of meal/food wasted most.

	Component		
	Discarded food	Not Opened Food	Unfinished Food
Advanced food in the dish after the meal	0.780	-	-
Excess cooked food	-	-	-
Leftovers preserved and no longer consumed	-	-	0.642
Open and unfinished products	-	-	0.934
Purchased and not open products	-	0.944	-
Products that are gone bad	0.880	-	-
KMO		0.738	
Cumulative Variance	44.36	60.52	75.38
Cronbach's Alpha	0.731	-	0.758
Extraction Method: Principal Component Analysis.			
Rotation Method: Oblimin with Kaiser Normalization.			
a. Rotation converged in 8 iterations.			

4.2. Motivation to Food Waste and Actions to Prevent it

When considering the main motivations for food waste, these attained scored low scores of the Semantic scale, but among the main ones, there is the presence of consumers' rhythms of life that are too frantic (mean = 2.232; Std. Deviation = 1.2757), the excessive cooking of food (mean = 2.052;

Std. Deviation = 1.1486), and the presence of inadequate portions during meals (mean = 2.039; Std. Deviation = 1.1716). The fact that supermarkets have too many offers is not considered by young consumers as a valid reason for food waste (mean = 1.604; Std. Deviation = 0.9730).

Two main components arise when performing a PCA on the motivations that consumers have to waste food (see Table 3). The first one in terms of importance with a cumulative variance of 58.56% is called Lack of Time to Cook Food and it is related to the frenetic pace of life of today's young people and their limited amount of time available for cooking and shopping, which leads them to let the food that is in the fridge run out or cannot eat leftovers from the previous days because they do not eat at home. The second component (cumulative variance 44.86%) is called Immoderate Use of Food and it concerns an excessive purchase and consumption of food as compared to what the consumer really needs. Consumers do not know how to handle the amount of food that they need when they shop at the grocery store, and not even when they cook, preparing inadequate food portions.

Table 3. PCA on motivations for food waste.

	Component	
	Immoderate Use of Food	Lack of Time to Cook Food
I buy more than I need	0.753	-
I do not know conservation methods	-	-
I cook too much	0.912	-
Supermarkets sell too many offers	-	-
I spend too much time from one purchase to the other and the food deteriorates	-	0.865
My rhythms of life are too frantic	-	0.840
The portions are inadequate	0.626	-
KMO		0.813
Cumulative Variance	44.86	58.56
Cronbach's Alpha	0.701	0.687
Extraction Method: Principal Component Analysis.		
Rotation Method: Oblimin with Kaiser Normalization.		
a. Rotation converged in 6 iterations.		

Investigating the main action consumers do to prevent food waste, they say to pay significant attention to offers, expiration dates, and formats (mean = 4.240; Std. Deviation = 0.8543), to try to cook proper portions (mean = 4.008; Std. Deviation = 0.8800), use leftovers (mean = 3.952; Std. Deviation = 1.0186), and purchase only what is necessary (mean = 3.918; Std. Deviation = 0.9465). An action that is not done frequently is instead the encouragement to donate food (mean = 2.484; Std. Deviation = 1.3076).

When performing a PCA on the actions that are done to prevent food waste (see Table 4), three main components arise. The first component (cumulative variance 71.95%) is called Care in Cooking Food and concerns the attention paid in preparing proper portions and reuse leftovers to create new dishes. The second component (cumulative variance 59.52%) is called Donation of Food, and it is linked to the actions that consumers do to push to donate food to people that need to be helped. The third component (cumulative variance 45.03%) is called Care in Doing Shopping, and it concerns the attention that consumers place when they shop at the supermarket, both as regards the purchase of seasonal foods and the attention that is paid to buying the right amount of food they need.

Table 4. PCA on action to prevent food waste.

	Component		
	Care in Doing Shopping	Donation of Food	Care in Cooking Food
Purchase only what is necessary	0.774	-	-
Buy seasonal products	0.830	-	-
Pay attention to offers, expiration dates, and formats	-	-	-
Cook proper portions	-	-	0.606
Use leftovers	-	-	0.921
Encourage the donation of food	-	0.936	-
KMO		0.805	
Cumulative Variance	45.03	59.52	71.95
Cronbach's Alpha	0.709	-	0.759
Extraction Method: Principal Component Analysis.			
Rotation Method: Oblimin with Kaiser Normalization.			
a. Rotation converged in 6 iterations.			

4.3. A market Segmentation

Evidence from recent researches [20,26,30,66] suggests that in the current environment young consumers have a greater complexity of attitudes in food behaviour and therefore a market segmentation has been developed to investigate young consumers' behaviour in relation to food habits and food waste. Hence, a two-step cluster has been performed.

The clustering procedure strongly suggested the presence of three clusters and the profile was depicted by using a variety of demographic and behavioural characteristics of the young consumers (Table 5).

The first cluster, named Proactive Consumers in Food Waste, consists of 25.3% of the sample and it is made up of consumers that seem to have low reasons to waste food and high attention in reusing all of the leftovers of their meals. What is more, they have the habit of taking leftovers home after eating outside, because they think that there are no right reasons to waste good food. This cluster is characterised in percentages more or less homogeneous by consumers between 18 and 21 years, 22–25 years, and 26–30 years, mainly students.

The second cluster is named Hesitant Consumers in Food Waste and is made up of 33.3% of the sample. This group is characterised by consumers that claimed to mainly waste food because they have frantic rhythms of life, or because they cook too much and their portions are inadequate. However, this group seems to have also the willingness to recover their leftovers, and mainly they reuse bread, pasta, and meat, but not to ask for taking home the leftovers after eating out because of shame. This group is composed in majority by students between 22 and 25 years of age.

The third cluster is named Uninterested Consumers in Food Waste and it comprises 41.3% of the sample. This second group is made up of consumers that have low reasons to waste food, and among the most cited there is the fact that they have a frantic rhythm of life, but they have a low interest in reusing leftovers and they claimed not to be interested to take leftovers home after eating out. Therefore, the waste of food is not among their main concerns, and they will not do anything to solve this problem. This cluster is composed in majority by employed consumers, or even unemployed, but still no more students with an age between 18 and 21 or between 31 and 35 years old.

Table 5. Food waste: market segmentation.

	Cluster 1:		Cluster 3:		Cluster 2:	
	Proactive Consumers in Food Waste		Hesitant Consumers in Food Waste		Uninterested Consumers in Food Waste	
	25.3% (235)		33.4% (302)		41.3% (367)	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
<i>Reason for food waste</i>						
I buy more than I need	1.44	0.719	2.64	1.152	1.72	0.911
I do not know conservation methods	1.20	0.532	2.05	1.064	1.33	0.654
I cook too much	1.45	0.739	2.86	1.161	1.79	0.981
Supermarkets sell too many offers	1.20	0.561	2.26	1.185	1.34	0.709
I spend too much time from one purchase to the other and the food deteriorates	1.35	0.745	2.51	1.263	1.53	0.866
My rhythms of life are too frantic	1.66	1.081	3.11	1.211	1.91	1.072
The portions are inadequate	1.44	0.732	2.87	1.213	1.76	0.983
<i>Reuse of leftovers</i>						
Fruits and vegetables	4.42	0.763	3.46	1.118	2.40	1.163
Pasta/rice	4.50	0.659	3.72	0.996	2.72	1.030
Bread	4.54	0.612	3.81	1.004	2.80	1.173
Biscuits	4.12	1.124	3.05	1.291	1.77	1.033
Meat	4.53	0.628	3.55	1.067	2.19	0.984
Fish	4.37	0.869	3.10	1.237	1.80	0.891
Milk and eggs	4.32	0.907	3.18	1.152	1.81	0.919
Ready meals	3.43	1.580	2.52	1.330	1.43	0.719
Sauces	3.83	1.348	2.73	1.321	1.60	0.851
Beverages	3.96	1.342	2.88	1.435	1.51	0.935

Table 5. Cont.

	Cluster 1:		Cluster 3:		Cluster 2:	
	Proactive Consumers in Food Waste		Hesitant Consumers in Food Waste		Uninterested Consumers in Food Waste	
	25.3% (235)		33.4% (302)		41.3% (367)	
<i>Habits of taking leftovers home (after eating outside)</i>	%	n	%	n	%	n
No, I'm ashamed to ask for my leftovers	22.6	52	46.5	107	30.9	71
No, I'm not interested	17.2	47	29.2	80	53.6	147
Yes, why waste good food?	34.3	109	27.4	87	38.4	122
<i>Age</i>						
18–21	25.0	44	29.0	51	46.0	81
22–25	25.2	105	39.9	166	34.9	145
26–30	27.0	51	26.5	50	46.6	88
31–35	20.5	9	18.2	8	61.4	27
<i>Occupation</i>						
Employed	19.6	33	29.2	49	51.2	86
Unemployed	17.0	8	29.8	14	53.2	25
Student	27.5	168	34.8	212	37.7	230

4.4. Elements Affecting Food Waste Behaviour

The binary regression model tries to identify which elements influence, in a positive or in a negative way, the probability of having a food waste behaviour by consumers. The dependent variable is a binary variable that takes the value 1 if the mean value of Food Waste Behaviour for each consumer is ≥ 2 point of the Semantic scale, otherwise zero (which corresponds to value 1 of the Semantic scale assumed to be as “not at all” Food Waste Behaviour). As it can be seen in Table 6, the logistic model allows for predicting the food waste behaviour with a probability that is equal to 69.6% when considering among the factors, consumers' age (see Table A1 in Appendix A), their main motivations to Food Waste (Table 3), and the main actions they do to prevent it (Table 4).

Table 6. Estimation of factors that defined the probability of High Food Waste.

Observed			Predicted		
			<i>Food Waste Behaviour</i>		Percentage Correct
			0	1	
Step 1	Food Waste Behaviour	0	465	201	69.8
		1	55	120	68.6
	<i>Overall Percentage</i>				

Among the factors that influence the Food Waste Behaviour of young people, age does not emerge as a statistically significant variable. Among the motivations pushing consumers to waste food, there are the facts that they buy more than they need (P-value < 0.01), they spend too much time

from one purchase to another so that food deteriorates (P-value < 0.05), and they cook inadequate portions (P-value < 0.05). Having very busy rhythms of life seems to negatively affect food waste (P-value < 0.05). Finally, when considering the actions preventing Food Waste, the activities that are statistically significant concern the reuse of leftovers (P-value < 0.05), the ability to buy only what is really needed (P-value < 0.10), the commitment in cooking good portions (P-value < 0.10), as well as the practice of food donation (P-value < 0.01) (Table 7).

Table 7. Factors influencing High Food Waste.

	B	S.E.	Wald	df	Sig.	Exp(B)
Dummy_age	0.276	0.221	1.567	1	0.211	1.318
<i>Motivations to Food Waste</i>						
I buy more than I need	0.348	0.094	13.758	1	0.000***	1.417
I do not know conservation methods	0.085	0.111	0.588	1	0.443	1.089
I cook too much	0.110	0.100	1.207	1	0.272	1.116
Supermarkets sell too many offers	0.129	0.102	1.622	1	0.203	1.138
I spend too much time from one purchase to the other and the food deteriorates	0.216	0.097	4.943	1	0.026**	1.241
Step 1^a My rhythms of life are too frantic	−0.181	0.094	3.705	1	0.054*	0.835
The portions are inadequate	0.243	0.097	6.208	1	0.013**	1.275
<i>Action to prevent Food Waste</i>						
Purchase only what is necessary	−0.229	0.121	3.583	1	0.058*	0.796
Buy seasonal products	−0.082	0.110	0.545	1	0.460	0.922
Pay attention to offers, expiration dates, and formats	−0.050	0.127	0.158	1	0.691	0.951
Cook proper portions	−0.221	0.130	2.875	1	0.090*	0.802
Use leftovers	−0.214	0.105	4.130	1	0.042**	0.808
Encourage the donation of food	−0.282	0.082	11.675	1	0.001***	1.325
Constant	−1.109	0.699	2.517	1	0.113	0.330

***P-Value < 0.01; **P-Value < 0.05; *P-Value < 0.10.

5. Discussion and Conclusions

The analysis of the data shows that Millennials seem to have correct food habits preferring the consumption of healthy food and showing interest in their health and physical wellbeing [66]. The greatest amount of waste comes from products that are opened and used and then not finished and therefore have gone bad. However, also food that is thrown away without even being opened represents a variable of importance in food waste, while discarded food is only in the third position. These results permit to answer to RQ1.

Answering to RQ2, it can be said that the lack of time and not knowing how to manage the food purchased are the two variables that group the main motivations that lead to wasting among the youngest. These results are in line with the previous literature that was considered, which underlines how food that is not properly managed positively affects the household food waste intensity [33,35,67], since the leftovers are sometimes forgotten or not re-used within a short time [33,35].

As for the main actions to prevent Food Waste that results from the study, these are related to the attention paid in shopping, having attention in planning it doing a shopping list, and also having care in cooking food. This is in line with prior research revealing that educating young consumers to plan their purchases and to re-use leftovers usually limits food waste, even if it strictly depends on personal attitudes, intentions, household habits, and contexts in which the food is purchased and consumed [20,35,67,68].

Clustering young Italian consumers' behaviour (RQ3), 41.3% of them seem not touched by the problem of food waste and with no desire to solve it. In any case, this scenario is not so disheartening, since a quarter of the population of young consumers (25.3%) seems instead to try to reduce food waste as much as possible, also having the will to reuse its leftovers, and a further 33.4% of the population,

called "hesitant", is partly attentive to the problem and could become important actors in the fight against food waste with proper education and information.

Trying to understand which elements influence the probability of having a Food Waste Behaviour by consumers (RQ4), the model shows no relations between age and food waste intensity, which is in contrast to previous literature demonstrating the greater propensity of younger people to waste food [9,20,24,35]. Motivations that statistically influence the Food Waste Behaviour are related to variables concerning the low ability to plan purchases and properly cook food, thus confirming what found by Mondéjar-Jiménez et al. [20], Principato et al. [26], Farr-Wharton et al. [33], and Griffin et al. [34]. The variable "purchase only what is necessary" negatively influences the Food Waste, again underlining the importance of planning food purchasing [45,46,50]. Additionally, the "ability of reuse leftovers" appears as a positive action contrasting the waste, as previously underlined in the literature [20,43–45]. Surprisingly, having busy rhythms of life affects in a negative way the Food Waste Behaviour, meaning that a frenetic lifestyle leads to an overall reduction in consumers' attitude towards food waste. This is in contrast with previous results of Quested et al. [35] and Farr-Wharton et al. [33].

5.1. Theoretical Contribution and Managerial Implications

In line with previous research, this study confirms that avoidable food waste comes from three main behavioural antecedents: over preparation, excessive purchase, and inappropriate conservation [47]. Excessive purchase [24,36] would stem from shopping behaviours, which are routinized [69]. Such routines could contribute to food waste [68]. Purchasing too much food would ultimately, lead to cooking too much food, resulting in leftovers, and contributing to food waste [24]. Therefore, planning routines (i.e., planning meals in advance or checking inventories) can also contribute to lower avoidable food waste. One way of counteracting over-preparation is to consume the household leftovers, which is necessary to help save money and reduce food waste [67]. To break the routine, it is advisable to make a shopping list. Planning routines can play an important role in reducing unplanned purchases and limiting food waste [20,26,67,70], since failure to check food stocks prior to shopping and neglecting to prepare an adequate shopping list are types of behaviour resulting in food waste [48].

To reduce waste in households, interventions should focus on increasing consumers' perceived behavioural control over food waste and persuading them that they can be a good provider without wasting food [17]. New educational campaigns against food waste should be carried out by providing them with a realistic perception of food waste as well as by teaching young consumers how to recognize the level of freshness of food [26].

Young adults are an accessible and valuable market segment [71]. 18–24 year olds are one of the highest exposed age-group to television advertising; approximately 2000 television advertisements for fast food restaurants annually [72]. Online consumers that are students (20–34 years) were the most likely to consume ready meals at home, order takeaway food to eat at home, pay more for convenience products, and order groceries/takeaway food online. Marketing gives the young adults more opportunities for such food [71], as youths are passive observers and easily capture messages of advertisements [73], which results in more food waste.

Retailers need to consider socially responsible marketing campaigns that target young people, due to the possible dangers of consumers' unbalanced and uncontrollable purchase decisions [74].

5.2. Conclusions, Limitations and Future Research Directions

Youths and young adults are claimed to be one of the largest segment of the population causing food waste. However, results from Mondéjar-Jiménez et al.'s. [20] and Principato et al.'s. [26] study would indicate that the type of diet may influence food waste. Moreover, it is difficult to claim that all youths and young adults are to be held accountable for food waste; indeed, households produce a large amount of food waste, and when compared to older adults, they lack the incentive and experience to effectively reduce waste. Indeed, youths are possibly more vulnerable to marketing strategies,

however, this should suggest that retailers need to consider their impacts on these target groups and indirectly, the environment, not how the consumers lack awareness. Furthermore, when considering the psychological aspects (especially evolutionary psychological aspects), this further suggests that anyone is susceptible to contributing to food waste, not just youths and young adults. Interventions that are subjected to youths are proposed, however, the food waste cannot be reduced by just one-way from the consumers, it goes both ways; consumers and retailers.

Therefore, holding only the consumers accountable expecting them to solve it will not solve the problem of food waste, and marketing and retailers should also consider ethics when it comes to food distribution, and that they are indirectly exacerbating food waste by manipulating the consumers. It should be noted, for instance, that consumers could accept misfit vegetables, especially if some price reduction is applied, as it has been observed at fresh food markets or in Alternative Food Networks [75,76]. Otherwise, young consumers could be educated regarding the negative impacts of advertisements, and potentially reduce the demands that result in food waste. To convey more sustainable consumption patterns, an important role is played by educational agencies and, in particular, by schools, in the ages of children and adolescents, as highlighted, in Italy and in several European countries, by the many school canteen projects [77–79].

On a local level, to reduce food waste and to promote a less wasteful food culture, interdisciplinary initiatives, fostering a dialogue on innovation in the agri-food system, through a collaborative approach, could be activated [80].

As for the main limitation of the research, this could derive from the fact that the study only considers a precise population of young consumers, namely the Italian one. It would be interesting in future research to compare the food waste behaviour of young Italian consumers with those of the main Mediterranean countries, who have a lifestyle and food behaviour that is very similar to the Italian in order to see similarities and differences and then make a comparison with the attitude of young Europeans of the North, which have food habits and a food behaviour that are very different to those of the south, once again to verify the differences of both food behaviour and attitude towards waste among.

Another limitation of the research is linked to the sampling method that was used. The CAWI methodology leads to the definition of a self-selected sample. With this type of sample, the potential units are likely to be committed taking part in the study, which can help in improving attendance and greater willingness to provide more insight into the phenomenon being studied, but there is also likely to be a degree of self-selection bias that should be underlined.

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Appendix A

Table A1. Socio-demographic features of the sample.

		N	%
Age	18–21	192	21.24
	22–25	451	49.89
	26–30	209	23.12
	31–35	52	5.75
Education	Primary School Diploma	1	0.11
	Middle School Diploma	7	0.77
	High School Diploma	434	48.01
	Bachelor Degree	301	33.30
	Master Degree	148	16.37
	PhD	13	1.44
Occupation	Employed	176	19.47
	Unemployed	59	6.53
	Student	669	74.00
Origin	North of Italy	262	28.98
	Center of Italy	223	24.67
	South and Islands	419	46.35

Table A2. Food habits: consumption of healthy and unhealthy foods by young Italians.

	N	Mean	Std. Deviation	Std. Error
Healthy Foods				
Bread	904	3.503	1.0649	0.0354
Pasta	904	3.887	0.9466	0.0315
Meat	904	3.402	0.9899	0.0330
Fish	904	2.887	0.9307	0.0310
Vegetables	904	3.990	0.9655	0.0322
Fruits	904	3.707	1.0417	0.0347
KM 0 products	904	2.822	1.0448	0.0349
Fat and Unhealthy Foods				
French fries	904	2.117	0.8297	0.0276
Cured meat	904	2.889	1.0115	0.0337
Brioche and sweets	904	2.980	0.9773	0.0326
Sodas	904	2.223	0.9680	0.0322
Ice-cream	904	2.298	0.8006	0.0267
Snacks	904	2.574	1.0031	0.0334
Candies	904	2.147	0.9800	0.0326
Wurstels	904	2.001	0.9638	0.0321
Sauces	904	2.422	0.9407	0.0314

Table A3. Type of meal/food wasted most.

	N	Mean	Std. Deviation	Std. Error Mean
Advanced food in the dish after the meal	893	2.405	1.3745	0.0460
Excess cooked food	892	1.614	0.8973	0.0300
Leftovers preserved and no longer consumed	893	2.707	1.2407	0.0415
Open and unfinished products	890	2.424	1.1321	0.0379
Purchased and not open products	896	1.579	0.8706	0.0291
Products that are gone bad	893	3.374	1.4003	0.0469
<i>Cronbach's Alpha</i>		0.738		

Table A4. Motivations for food waste.

	N	Mean	Std. Deviation	Std. Error
I buy more than I need	882	1.966	1.0818	0.0350
I do not know conservation methods	885	1.544	0.8819	0.0421
I cook too much	880	2.052	1.1486	0.0293
Supermarkets sell too many offers	878	1.603	0.9730	0.0347
I spend too much time from one purchase to the other and the food deteriorates	881	1.806	1.1118	0.0284
My rhythms of life are too frantic	883	2.232	1.2757	0.0301
The portions are inadequate	883	2.039	1.1716	0.0410
<i>Cronbach's Alpha</i>		0.738		

Table A5. Action to prevent food waste.

	N	Mean	Std. Deviation	Std. Error
Purchase only what is necessary	883	3.918	0.9465	0.0250
Buy seasonal products	880	3.785	0.9894	0.0341
Pay attention to offers, expiration dates, and formats	882	4.240	0.8543	0.0403
Cook proper portions	883	4.008	0.8800	0.0209
Use leftovers	880	3.952	1.0186	0.0342
Encourage the donation of food	882	2.484	1.3076	0.0355
<i>Cronbach's Alpha</i>		0.751		

Appendix B

Questionnaire: Food consumptions amongst the youth living in Italy

1. Age:

- ☐ 18–21
- ☐ 22–25
- ☐ 26–30
- ☐ 31–35

2. Education

- ☐ Primary school diploma
- ☐ Middle School diploma
- ☐ High school diploma
- ☐ Bachelor's degree

- ☐ Master's degree
- ☐ PhD

3. Profession:

- ☐ Student
- ☐ Worker
- ☐ Unemployed

4. Where do you live?

- ☐ North of Italy
- ☐ Center of Italy
- ☐ South and islands

5. Where do you mainly buy groceries?

- ☐ Market
- ☐ Little specialized shops
- ☐ Supermarket
- ☐ Discount store / Low-cost supermarket
- ☐ Directly from the producer (farmer)

6. On a daily basis, how many times do you have these meals? (Semantic scale: 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Always)

- ☐ Breakfast
- ☐ Morning snack
- ☐ Lunch
- ☐ Afternoon snack
- ☐ Dinner

7. How often do you consume these groceries? (Semantic scale: 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Always)

- ☐ Bread
- ☐ Pasta
- ☐ Meat
- ☐ Fish
- ☐ Vegetable
- ☐ Fruit
- ☐ Km 0 food products

8. How frequently do you drink? (Semantic scale: 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Always)

- ☐ Water
- ☐ Wine
- ☐ Alcoholic beverage
- ☐ Beer
- ☐ Juice
- ☐ Soda

9. How many times do you eat out?

- ☐ At least 1 time per day
- ☐ 2–3 times in a week
- ☐ Once a week
- ☐ 2–3 times in a month
- ☐ Never

10. How frequently do you consume these groceries? (Semantic scale: 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Always)

- ☐ French fries
- ☐ Cured meat
- ☐ Brioches and sweets
- ☐ Sodas
- ☐ Ice-cream
- ☐ Snacks
- ☐ Candies
- ☐ Wurstels
- ☐ Sauces

11. In your family, how often do you throw still edible food away? (Semantic scale: 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Always)

- ☐ Fruit and vegetable
- ☐ Pasta /rice
- ☐ Bread
- ☐ Meat
- ☐ Fish
- ☐ Milk and eggs
- ☐ Ready meals
- ☐ Sauces
- ☐ Beverages

12. How many times in your family do you eat leftovers or use them to create other dishes? (Semantic scale: 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Always)

- ☐ Fruit and vegetable
- ☐ Pasta /rice
- ☐ Bread
- ☐ Meat
- ☐ Fish
- ☐ Milk and eggs
- ☐ Ready meals
- ☐ Sauces
- ☐ Beverages

13. Which kind of food do you throw away more often? (Semantic scale: 1 = Not at all; 2 = A bit; 3 = Indifferent; 4 = Well enough; 5 = A lot)

- ☐ Advanced food in the dish after the meal
- ☐ Excess cooked food
- ☐ Leftovers preserved and no longer consumed
- ☐ Open and unfinished products

- ☐ Purchased and not open products
- ☐ Products that are gone bad

14. Why do you waste food? Indicate how much these motivations influence your decision. (Semantic scale: 1 = Not at all; 2 = A bit; 3 = Indifferent; 4 = Well enough; 5 = A lot)

- ☐ I buy more than I need
- ☐ I do not know conservation methods
- ☐ I cook too much
- ☐ Supermarkets sell too many offers
- ☐ I spend too much time from one purchase to the other and the food deteriorates
- ☐ My rhythms of life are too frantic
- ☐ The portions are inadequate

15. How do you eliminate the waste?

- ☐ I throw it away in the rubbish
- ☐ I use it for animal feed
- ☐ I use it as fertilizer
- ☐ Other

16. After eating out, do you bring the leftover food at home?

- ☐ No, I'm ashamed to ask for my leftovers
- ☐ No, I'm not interested
- ☐ Yes, why waste good food?

17. What do you do with an expired product? *

- ☐ If it is not spoiled, I try it
- ☐ I will throw it away directly
- ☐ It depends on the type of the product

18. Which one of these products do you eat even after the date of expire? (Semantic scale: 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Always)

- ☐ Fruit and vegetable
- ☐ Pasta/rice
- ☐ Bread
- ☐ Meat
- ☐ Fish
- ☐ Milk and eggs
- ☐ Ready meals
- ☐ Sauces
- ☐ Beverages

19. In your opinion, why the wasted food would be a problem?

- ☐ It has negative impacts on the environment
- ☐ It is a waste of money
- ☐ The wasted food could have been used by people who need it

20. In your opinion, how much these people waste food? (Semantic scale: 1 = Not at all; 2 = A bit; 3 = Indifferent; 4 = Well enough; 5 = A lot)

- ☐ Supermarkets
- ☐ Restaurants
- ☐ Families
- ☐ Canteen
- ☐ Hospitals

21. How much in your daily life do you carry out the following actions to reduce food waste?

- ☐ Purchase only what is necessary
- ☐ Buy seasonal products
- ☐ Pay attention to offers, expiration dates, and formats
- ☐ Cook proper portions
- ☐ Use leftovers
- ☐ Encourage the donation of food

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