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FOOD WASTE FROM THE PERSPECTIVE OF ASSESSMENT OF ATTITUDES AND BEHAVIOURS OF YOUNG CONSUMERS

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Abstract: The subject of wasting food, as it relates to the reduction of losses and waste, holds an important place in European Union and United Nations agendas. Constant monitoring of the causes of this phenomenon among consumers is very useful in its prevention. It enables modifying and properly targeting educational campaigns and shaping social norms. The aim of this study was to examine the attitudes and behaviours of young consumers in relation to wasting food. The study was conducted in 2021–2022 among young consumers studying at universities (n = 507), using the indirect on-line survey measurement method. The results demonstrated that planning rational purchases helps limit food waste in this consumer group. Young consumers carefully purchase products, which may be a consequence of limited budgets. The study has shown that before making purchases, the majority always check their current food supplies, try to limit food waste in their household and try not to throw away any foodstuff. Additionally, the study has shown that a major part of them know and apply various methods of using leftover food to prepare simple, multi-ingredient dishes. The results presented in this paper may indicate that the wastage-related educational campaigns conducted in Poland are effective.

Keywords: waste causes, moral attitudes, reduction methods.

1. INTRODUCTION

Food waste is a phenomenon involving the failure to use food materials and products as intended, i.e. to be consumed by humans, that were originally produced for consumption purposes, regardless of the stage of the nutrition chain where this occurred: from primary production to processing and distribution, to final consumption in households [Raport FPBŻ 2021]. Food waste is an effect of imbalanced food production and consumption. It is estimated that about 30–50% of all food produced worldwide is wasted [Ahmed et al. 2021; Principato et al. 2021]. The scale of the issue of food waste during the individual links of the nutrition chain is different in economically developed and developing countries. In developed

countries, the main problem is wasting food at the consumption stage. Households are considered the key entities responsible for the wastage. On the other hand, in developing countries, food losses occur mainly during primary food production, processing and storage. Food losses and wastage are defined separately, as they occur at different stages of the nutrition chain and are caused by different factors. Food losses occur between primary production and distribution, while wastage takes place mainly in commerce, gastronomical establishments, and in households [Garbowska, Radzyńska and Tarczyńska 2021].

By generating negative economic, social and environmental consequences [Garbowska, Radzyńska and Tarczyńska 2021; Niedek and Krajewski 2021], food waste is becoming the main challenge for the development of sustainable nutrition systems [Ahmed et al. 2021]. Due to this fact, in recent years this phenomenon has been attracting increasing attention from local, national and European politicians, as well as international organisations, non-governmental organisations, and scientists from various fields [Schmidt 2016; Akas et al. 2018; Schanes, Dobernig and Gozet 2018; Bilka, Tomaszewska and Kołożyn-Krajewska 2020a, 2020b; Aydin and Yildirim 2021; Tarczyńska 2021]. Due to the gravity and scale of this phenomenon, the UN has set a global target to reduce food losses and wastage by half by 2030 [Principato et al. 2021]. The issue of food waste currently holds an important position in the EU political agenda. In the framework directive on waste, the European Commission has obliged the member states to reduce food waste by 30% by 2025 [European Commission 2019].

Conducting information campaigns to prevent waste is an important element in limiting this phenomenon. In the literature it is stressed that the structure of waste should be continuously monitored, so that the awareness-spread of the conducted informational and educational actions can be assessed [Garbowska, Radzyńska and Tarczyńska 2021]. The scale of food wastage in EU countries occurs mainly at the level of households, as they generate the greatest quantities of food waste [Niedek and Krajewski 2021]. The published data indicates that households are a significant source of the generated food waste [FUSIONS 2015]. According to FAO, the term 'food waste' applies to food intended for consumption by humans, which was not actually consumed.

Understanding the causes of waste among consumers is therefore very useful in preventing this phenomenon, by properly targeting the educational campaigns and shaping of social norms. Determining the attitudes and behaviours of consumers as concerns food waste is critical for the development of sustainable food systems. As some researchers note [Mustafa and Andreescu 2018; Ahmed et al. 2021], insufficient data concerning food wastage by consumers on the local level limits the implementation of local solutions. These solutions should take into account the different social, environmental and economic factors that affect the consumers' value systems, perception, knowledge and behaviours motivating them to reduce food waste.

In the context of the content discussed above, this paper focuses on the phenomenon of food waste among young Polish consumers (students). This group is interesting from a research perspective and constitutes an important one, whose attitudes are shaped dynamically and whose choices will determine the quality of future social and economic life. Research into this group began with an earlier qualitative study on consumer attitudes and behaviours concerning food waste [Garbowska, Radzyńska and Tarczyńska 2021].

The purpose of this study was to:

- 1) determine the types of foodstuffs that young consumers discard most frequently,
- 2) determine the causes of wasting food and the ways to reduce it,
- 3) study food waste from the following perspectives: behaviours connected with purchase decisions, moral attitudes, subjective norms, and intentions toward the non-wasting of food.

2. RESEARCH METHODOLOGY

The study utilised the results of empiric research conducted in 2021–2022 among young consumers, aged 21–25, who were students of: Warsaw School of Economics, University of Warmia and Mazury in Olsztyn and Gdynia Maritime University. The non-probabilistic sampling method - convenience sampling was used. The study was conducted by means of an indirect on-line survey measurement method, using survey questionnaires posted as a Google form.

The first part of the survey questionnaire contained statements concerning the types of foodstuffs most often thrown away, causes of food waste and methods of reducing it. This module of the questionnaire was prepared based on an analysis of the results of the qualitative research previously conducted among young consumers [Grabowska, Radzyńska and Tarczyńska 2021]. The second part of the research tool concerned the phenomenon of food waste from the following perspectives: behaviours connected with purchase decisions, moral attitudes, subjective norms, and intentions toward non-wasting of food. The list of statements provided in this section was adapted from the research process used by Stefan et al. [2013].

In the survey, the respondent expressed their level of approval or disapproval towards the statements provided using a 7-degree Likert scale, with firm disagreement with a statement corresponded to score 1 and firm agreement with a statement corresponded to score 7. A total of 507 questionnaires were collected as part of this procedure.

The results were subjected to statistical analysis using Statistica 13.3 software. The following were used to interpret the results:

- central trend measures: arithmetic mean (\bar{x}), median (M), mode (Me);
- dispersion measure: standard deviation (SD);
- shape measure: skewness (S), kurtosis (K);

- percentage distribution of individual scores (% selected: N – negative, A – neutral/ambivalent, P – positive).

3. RESULTS

The research was limited to those respondents who declared that, when they began the survey, throwing food away does happen. The foodstuffs declared by the respondents as thrown away most frequently are shown in Table 1. It was found that the most commonly wasted products were fruit and vegetables (about 69% of the declarations), baking/confectionery products (59% of the declarations), as well as milk and dairy products (about 52% of the declarations). It was observed that about 24% of the respondents most frequently threw away meat and meat-based products. Eggs (10%), fish/fish products as well as oils and fats (each about 7% of the declarations) were placed lower.

In comparing the results obtained from professional literature, one can note discrepancies in the declared thrown-away product structures. The differences may result from the specific characteristics of the respondents studied. This research conducted on a representative sample of Polish consumers indicated that the highest percentage “often and sometimes” threw away such products as bread (24%), cold meats, vegetables except root vegetables, milk-based beverages, and fresh fruit. The authors have observed that age affects the frequency of throwing food away. Bread was most often wasted by people aged 18–24 [Bilska, Tomaszewska and Kołożyn-Krajewska 2020a, b]. On the other hand, the Federation of Polish Food Banks report [2018] indicated that in the years 2012–2018, Polish consumers most frequently threw away bread, fruits, vegetables, and cold meats.

The greatest increase in the quantities of wasted food products and ingredients was observed in 2014, and since 2016 these values have remained at similar levels [FPFB Report 2018]. Research conducted on a group of Polish students [Tarczyńska 2021] indicates that 1/4 of the surveyed group threw away bread, and about 1/5 threw away vegetables. About 15% of the surveyed admitted they threw away fruit, milk and milk-based beverages. The least frequently wasted products were eggs (1.49%), cheese (2.98%) and meat (6.38%).

Among Dutch households, on the other hand, products of the baking industry were thrown away in the greatest quantities, while meat products were the least wasted [Van Dooren et al. 2019]. The food products usually thrown away by Irish consumers were vegetables, which constituted as much as half of all the unused food [EPA 2017]. Research on Norwich households indicated that bread was mainly the most often wasted product [Hanssen, Syversen and Stø 2016]. Additionally, other studies indicated [Skotnicka, Karwowska and Śmiechowska 2018] that Poles living in Poland and Great Britain most frequently threw away bread, yoghurt, sausages, fruits, vegetables, etc.

Table 1. Foodstuffs declared by the respondents as thrown away most frequently

Product categories	Declarations [%]
Meat and meat-based products	23.86
Milk and dairy products	52.46
Bakery/confectionery products	58.77
Fruits and vegetables	68.83
Fruit/vegetable preserves	26.43
Ready-made meals and dishes	37.87
Fish/fish-based products	7.29
Oils and fats	6.71
Eggs	9.86

Source: own study.

Food waste in households may be caused by non-rational purchases, preparing too large meal portions, lack of understanding of information printed on food packaging, exceeding expiry dates, improper food storage, errors in preparing meals, and improper scheduling of consuming products according to their expiry dates [Razak 2017; Grabowska, Radzyńska and Tarczyńska 2021]. This research attempted to determine the causes of food waste among the surveyed. It was found (Tab. 2) that the main motives for throwing food away were exceeded expiry dates (average score 5.44 ± 1.57 , $M = 6$) and lack of time to use the food in possession, resulting in wastage ($M = 6$). Additionally, the majority of the surveyed indicated too large meal/product portions (about 63%) and failures to check the product's expiry date before purchase (about 56%). It is notable that about 43% of the surveyed indicated improper storage of the products as a cause for wasting food. Furthermore, the results showed that purchasing unnecessary products under the influence of marketing actions (mean score 2.91 ± 1.78 , $M = 3$, $Me = 1$) and ill-considered purchases (mean score 3.54 ± 1.89 , $M = 3$, $Me = 1$) were not among the major causes of food waste.

These results were similar to other data also obtained from the group of young consumers. In the study by Tarczyńska [2021], the most common causes for throwing food away were spoiling and expiry. A Federation of Polish Food Banks report [2020] indicates that the most common reasons for throwing food away were spoiling (65.2%), expiry (42%), preparing too much food (26.5%), and making too large purchases (22.2%).

Table 2. Reasons/causes of throwing food away among the surveyed

Variables	x	SD	T	Me	S	K	Response [%]		
							N	A	P
Purchase of unnecessary products influenced by marketing tools	2.91	1.78	3	1	0.53	-0.93	66.68	8.08	25.24
Inadequate cooking skills	2.97	1.65	2	1	0.57	-0.75	69.44	10.26	20.30
Lack of time to use food owned	4.83	1.82	6	6	-0.97	-0.25	25.26	6.90	67.84
Failure to check expiry date before purchase	4.20	1.93	5	5	-0.34	-1.15	39.07	5.32	55.61
Too large meal/product portion	4.51	1.78	5	5	-0.71	-0.51	29.24	7.27	63.49
Purchase of poor-quality product	3.84	1.81	4	5	-0.09	-1.12	46.56	10.65	42.79
Purchase of too large amount of product	4.24	1.86	5	5	-0.44	-0.94	36.70	7.88	55.42
Lack of ideas for using ingredients	3.41	1.85	3	1	0.18	-1.19	55.23	10.45	34.32
Damaged packaging	3.27	1.82	3	2	0.37	-1.04	60.37	10.45	29.18
Ill-considered purchases	3.54	1.89	3	1	0.16	-1.22	54.25	10.06	35.69
Improper product storage	3.79	1.84	4	5	-0.13	-1.24	46.96	9.46	43.58
Product expiry	5.44	1.57	6	7	-1.22	0.97	15.59	4.34	80.07
Food being cheap, and easy to discard	1.97	1.38	1	1	1.60	1.99	87.60	3.94	8.46

x – arithmetic mean, M – median, Me – mode, SD – standard deviation, S – skewness, K – kurtosis, N – negative responses, A – neutral/ambivalent responses, P – positive responses.

Source: own study.

The results of a different study [Bilska, Tomaszewska and Kołożyn-Krajewska 2020a, b] show that people with higher education more often waste food, e.g. due to expiry, but tended to pay greater attention to observing proper food storage conditions. Level of education is considered a variable that effects the difference in wasting food, as better educated people enjoy higher incomes, but have less time to rationally manage food.

Food waste does not reflect a single specific behaviour, but rather stems from the way that a household manages the purchasing, producing, preparing, and consuming of foodstuffs [Quested et al. 2013]. Everyday nutritional practices affect food waste [Porpino, Parente and Wansink 2015]. It is suggested in the literature that food management in households has a positive effect on the frequency of throwing food away [Bravi et al. 2020].

Table 3 presents the phenomenon of food wastage from the perspective of: assessment of behaviours connected with purchase decisions, moral attitudes, subjective norms, and intentions toward non-wastage of food.

The research results show that most students (about 57%) mostly planned purchases in advance ($Md = 5$, $M = 5$) and mostly checked their current food supplies before making more purchases (about 74%, $Md = 5$, $M = 5$). On the other hand, a minority did not plan consumption in advance (about 39%, mean score 3.82 ± 1.55). 42% of the surveyed indicated that they purchase too many food products. About 30% of the surveyed declared that they purchased products in packages that were too large for their households.

Table 3. Food wastage from the perspective of assessing selected attitudes and behaviours related to managing the rationalisation of purchases and meal preparation

Variables	x	SD	T	Me	S	K	Response [%]		
							N	A	A
Planning the shopping and meals									
I always make a shopping list when planning the shopping	4.21	1.83	5	5	-0.23	-1.10	41.04	1.58	57.38
I always check the food supply I have before buying food	4.83	1.44	5	5	-0.74	0.03	20.93	4.33	74.74
I always plan meals in advance	3.82	1.55	4	3	0.17	-0.81	48.74	12.03	39.23
Shopping habits/decisions									
I frequently buy food in packages that are too large for my household	3.50	1.63	3	3	0.35	-0.74	57.02	13.42	29.56
I often buy too much food	3.91	1.58	4	5	-0.01	-0.83	44.59	13.41	42.00
Behavioural control									
I try to limit the amount of food wasted in my household	5.54	1.30	6	5	-1.21	1.85	7.32	5.71	86.97
I can cook and prepare exactly the number of meals that my household needs	4.31	1.51	5	5	-0.34	-0.65	31.98	12.42	55.61
I can buy exactly the amount of food that my household needs	4.19	1.50	5	5	-0.22	-0.70	34.93	14.99	50.08
Moral attitudes									
I am bothered by throwing foodstuffs away	5.79	1.32	6	7	-1.28	1.50	6.72	8.48	84.80
When I throw food away, I feel guilty	5.41	1.61	6	7	-1.07	0.44	14.23	8.08	77.69
Concern									
I am concerned about the amount of food I throw away	4.87	1.76	5	6	-0.66	-0.56	24.84	9.07	66.09
I am concerned about the costs of the foodstuffs I throw away	5.12	1.68	5	7	-0.78	-0.28	19.54	8.48	71.98
Subjective norms									

Most people important to me do not approve that I throw away a portion of my food	3.97	1.47	4	4	-0.05	0.32	44.59	38.46	16.95
Most people important to me do not approve that I cook/prepare large amounts of food	3.55	1.52	4	4	0.07	-0.34	40.64	39.25	20.11
Intention to not waste food									
I intend not to throw food away in the future	5.19	1.45	5	5	-0.62	-0.02	13.24	14.39	72.37
Generally I try very hard not to throw food away	5.79	1.25	6	7	-1.22	1.72	6.13	4.14	89.73

x – arithmetic mean, M – median, Me – mode, SD – standard deviation, S – skewness, K – kurtosis, N – negative responses, A – neutral/ambivalent responses, P – positive responses.

Source: own study.

According to literature sources, thorough planning of food purchases is an effective tool in preventing food wastage [Parizeau, von Massow and Martin 2015; Secondi, Principato and Laureti 2015]. It has been shown that planning purchases and culinary practices/household skills play a crucial role in food wastage [Stancu, Haugaard and Lähteenmäki 2016; Visschers, Wickli and Siegrist 2016]. It has been noted that there is a strong correlation between making shopping lists and planning meals in advance as well as checking food supplies before shopping [Quested et al. 2013]. It was observed that shopping lists allow food wastage to be reduced by 20% [Jörissen, Priefer and Bräutigam 2015]. It is emphasised that information about food products stored at home before shopping is the key to avoiding unnecessary food purchases. This practice would result in reducing wastage due to expiry [Farr-Wharton, Foth and Choi 2014]. It has been observed that those households that have better food consumption management skills wasted less products [Fami et al. 2019]. Purchasing greater quantities of products than necessary is considered the main factor behind food wastage [Janssens et al. 2019]. Meal planning helps to avoid excessive purchases caused, for example, by special offer marketing [Romani et al. 2018].

A key role in behaviours related to food waste is played by perceived behavioural control. Consumers who believe in their ability to reduce waste and are convinced they have this phenomenon under control are more inclined to directly reduce food waste or at least have a greater tendency towards non-waste [Graham-Rowe, Jessop and Sparks 2015; Mondéjar-Jiménez et al. 2016; Stancu, Haugaard and Lähteenmäki 2016; Visschers, Wickli and Siegrist 2016]. The research conducted as part of this study indicates that the vast majority (87% of young consumers) declared that they try to reduce food wastage in their households (mean score 5.54 ± 1.30 , Md = 6, M = 6) About 90% of the surveyed try not to throw food away (mean score 5.79 ± 1.25 , Md = 6, M = 7). On the other hand, about half of the respondents have a sense of control over the rationalisation of purchases and meal

preparation. These people are able to purchase (about 56%) and prepare/cook (about 50%) an amount of products adequate to their household's needs. It was also found that an intention to not waste food in the future was declared by about 73% of the surveyed. Literature studies [Stefan et al. 2013] indicate that an intention to not waste food has no significant effect on reported food wastage. Even if consumers declare a high intention to reduce food wastage, their will often does not translate into action. This may stem from the fact that wastage is not generated by conscious intentions, and household practices related to food management appear to be a better indication of food wastage.

Studies conducted by other authors indicate that consumers consider throwing food away an improper behaviour [Porpino, Parente and Wansink 2015]. Most households indicate that they are, at least to some degree, concerned about throwing away food [Abeliotis, Lasaridi and Chroni 2014]. It has been shown that concern for food waste is a significant predictor of food waste reduction [Principato et al. 2021] and plays an important role in the intent to reduce food wastage [Stefan et al. 2013; Stancu, Haugaard and Lähteenmäki 2016]. It is also emphasised particularly that a feeling of guilt can act as an important motivation for reducing food wastage [Quested et al. 2013]. Households that have a greater feeling of guilt for food wastage throw away smaller amounts of food [Parizeau, von Massow and Martin 2015]. It is suggested that a food waste reduction can be induced by the feeling of guilt, which affects consumers like a moral norm to waste less food [Schanes, Dobernig and Gozet 2018]. As a result of the research, it was found that the vast majority of young consumers are bothered by throwing away foodstuffs (about 85%, mean score 5.79 ± 1.32 , Md = 6, M = 7). The surveyed generally declared a feeling of guilt about food wastage (about 78%, mean score 5.41, Md = 6, M = 7). In general, most of the surveyed (about 72%) are also concerned about the costs of the discarded products. It was observed, however, that subjective norms (social environment) in most cases have no effect on food waste among the surveyed (Md = 4, M = 4).

The results obtained are compatible with those found in the literature. Research on the ethical dimension of food wastage [Setti et al. 2016] indicates a high degree of concern related to wastage (about 86% of declarations). Consumers are not comfortable wasting food due to the perceived value [Graham-Rowe, Jessop and Sparks 2014]. It is emphasised that avoiding food wastage stems mainly from frugality as well as the responsible and economical use of products [Watson and Meah 2012]. It has been shown that younger people focus more on the financial aspect of food wastage, while older people express greater concern about its social and environmental consequences [Blichfeldt, Mikkelsen and Gram 2015]. It has been demonstrated that subjective norms have no impact on behaviours related to food wastage [Graham-Rowe, Jessop and Sparks 2015; Visschers, Wickli and Siegrist 2016]. On the other hand, moral norms arising out of a sense of duty to not waste food turn out to be a significant direct predictor of food wastage. This suggests that if consumers present a strong moral stance opposing food wastage, they have

a tendency to reduce wastage [Vischers, Wickli and Siegrist 2016]. Subjective norms (perception by an individual of whether their social environment, such as friends, family and neighbours exhibit or avoid certain behaviours), however, are not a significant predictor of food wastage reduction [Graham-Rowe, Jessop and Spark 2015].

It is emphasised in the literature that, even in the absence of shopping and meal planning, proper utilisation of leftovers can contribute to reducing wastage [Stancu, Haugaard and Lähteenmäki 2016]. Table 4 shows the methods of reducing food wastage declared by the surveyed. It is observed that about 73% of the respondents reuse of food leftovers and find ways to use excess bread. About 57% of the respondents use excess products to make alternative dishes, such as spreads or stuffing. Also a little over half of the surveyed (about 52%) prepare kopytka or gnocci out of excess cooked potatoes. About 1/3 of the respondents utilise excess fruits to make kompots, jams or preserves.

Table 4. Methods of reducing food waste in the households of young consumers

Variables	Definitely not/no/I guess not	Don't know, no opinion	Definitely yes/yes/I guess so
I always store food under proper conditions	13.23	11.04	75.73
I use leftover food	20.93	6.50	72.57
I make jams, preserves and/or kompots from excess fruits	58.98	8.48	32.54
I make kopytka, gnocci, etc. from excess cooked potatoes	38.47	9.07	52.46
I make toasts, breadcrumbs, egg-soaked bread from excess bread	21.77	5.52	72.77
I use excess products to make alternative meals or dishes, such as spreads or stuffing	31.57	12.03	56.40

x - arithmetic mean.

Source: own study.

Reuse of leftovers is considered one of the most effective strategies for controlling food wastage at the household level [Secondi, Principato and Laureti 2015]. Households that regularly use their leftovers produce less food waste [Stefan et al. 2013; Stancu, Haugaard and Lähteenmäki 2016]. Even though the reuse of leftovers is valuable due to the reduction of environmental and financial losses, leftover utilisation often encounters barriers. One of them is the time that needs to be devoted to it [Cappellini and Parsons 2012]. Additionally, leftovers may be stored in the fridge for too long and become forgotten. As the results of this study show, utilising leftovers and excess food helps to reduce food wastage by young consumers.

4. CONCLUSIONS

As a result of the study, the following observations and conclusions have been formulated:

1. The products most frequently wasted in young consumer households are: fruits and vegetables, bakery/confectionery products, as well as milk and dairy products.
2. The main determinants of throwing food away are: product expiry, lack of time to use all food possessed – resulting in its wastage, too large meal/product portions, and failure to check the expiry date before making a purchase.
3. Ill-considered purchases, including purchasing unnecessary products under the influence of marketing actions, are not causes for food waste among young consumers. Young purchasers carefully make product purchase decisions, which may be a consequence of limited budgets. It has been demonstrated that the vast majority of respondents find it difficult to waste foodstuffs. These people are concerned about the costs of the food they might throw away.
4. The study has shown that, before making purchases, most of the surveyed always checked their current food supplies, try to limit food waste in their household and try not to throw away foodstuffs. Planning rational purchases helps in limiting food waste in this consumer group.
5. A majority of the surveyed were familiar with and used various ways of utilising food leftovers to prepare simple, multi-ingredient dishes, such as spreads, stuffing, kopytka, gnocci, kompots, jams, and preserves.

The results presented in this paper may indicate that the wastage-related educational campaigns conducted in Poland are effective. A limitation of the results presented in this paper is the focus solely on young consumers studying at universities. In the future, it would be desirable to verify the results obtained within the same consumer segment, but in a broader scope of subjects, without the limitation to choosing students. Constant monitoring of the phenomenon of wastage among consumers is very useful in preventing it. It enables modifying and properly targeting educational campaigns and shaping social norms.

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