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CONSUMER ATTITUDES AND BEHAVIORS TOWARDS THE PROBLEM OF FOOD WASTE AND THEIR DETERMINANTS

Abstract: With the development of civilisation, the world has recorded an increase in the production, processing, and consumption of food. An excessive supply of various food products leads to irrational purchases and, consequently, to wastage of food products and raw materials. This has negative social, economic and environmental consequences. Because food waste occurs in households on the largest scale compared to other stages of the food chain, a study of consumer attitudes and behaviour towards the food waste problem was undertaken. The study was conducted in 2024 on a sample of 306 consumers, using an online survey. Consumer attitudes were examined along cognitive, emotional, and behavioural dimensions. The thematic scope of the analysis included issues such as consumer perceptions of food waste, individual behaviour, and habits of consumers, the most commonly wasted food products, and opportunities to reduce this phenomenon by promoting sustainable consumer practices. Food waste occurs mainly when it exceeds the expiration date, excessive purchases, or improper food storage. Ninety % of the respondents admitted that they throw away food, including one in three, several times a month. The most commonly discarded food products are leftovers of meals, bread, fruit, and vegetables. The vast majority of respondents (98%) were aware of the problem of food waste and tried to reduce it by using various practices, such as checking before going shopping what products were in the house, using products from the previous day, or freezing excess food.

Keywords: food waste, households, causes of food waste, reduce food waste

1. Introduction

With the development of civilisation, an increase in food production, processing, and consumption has been observed worldwide. In addition to the positive phenomena of opening up to new markets and the increased availability of food products, this brings about several negative changes (Stefan et al., 2013; Śmiechowska, 2015). This is because

the oversupply of food products and their diverse assortment lead to irrational purchases among consumers and, consequently, to the waste of food products and raw materials that could be allocated for consumption (Siedlecka et al., 2024; Tarczyńska, 2021). A significant amount is treated as waste daily, even though it is still fit for consumption (Dąbrowska & Janoś-Kresło, 2013; Mucha & Oravec, 2025). This

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problem occurs at every stage of the food chain, from production, processing, and distribution to consumption (Hajdas, 2018). It is one of the biggest problems of the 21st century, with serious environmental, economic, and social consequences (Czernyszewicz et al., 2022; Dąbrowska & Janoś-Kresło, 2013; Kumm et al., 2012; Von Massow et al., 2019).

It is important to stress that food waste is not only a missed opportunity to reduce the number of hungry people but also a waste of all natural resources that have been used to produce food. Unused food also means more waste, and its storage leads to greenhouse gas emissions, contributing to climate change (Kwasek & Kowalczyk, 2023, Boiteau & Pingali, 2023). Considering the importance of this problem, this research was undertaken to identify young people's attitudes towards food waste and their socio-demographic and economic determinants.

1.1. Defining food waste

There is no harmonised definition of 'food waste' in EU legislation, and the phenomenon is often also referred to as 'food waste' (Boiteau & Pingali, 2023). According to the European Parliament, in common parlance, 'food waste' refers to food products discarded outside the agri-food chain for economic or aesthetic reasons or because they are approaching their expiration date, but which are still fit for consumption and fit for human consumption, but which, for lack of a possible alternative use, are destined for disposal and waste disposal, resulting in negative externalities in terms of environmental impact, economic costs, and lack of revenue for businesses (European Parliament Resolution of 16 May 2017). When discussing food waste, there is a distinction between two concepts: food loss and food waste. Food loss is defined as a reduction in the quantity or quality of food resulting from the decisions and actions of food suppliers in the agri-food chain, excluding retailers, caterers, and consumers (FAO, 2019).

Empirically, food loss refers to any food that is discarded, incinerated, or otherwise removed from the food supply chain, that is, from harvest/slaughter/fishing to, but excluding, the retail level and not reused for other production purposes such as animal feed. Food loss includes the loss of products with inedible parts. Food waste, on the other hand, is defined as a reduction in the quantity or quality of food resulting from the decisions and actions of retailers, food services, and consumers (FAO, 2019). It is most often associated with over-purchasing, misreading expiry dates, improper storage, or discarding wholesome food by consumers (Kwasek & Kowalczyk, 2023; Nidek et al., 2019; Priefer et al., 2016). Such activities have been observed mainly in developed countries (Aschemann-Witzel et al., 2015). It should be emphasised that food waste also occurs in developing countries even though they face food shortages. In these countries, food losses occur early in the supply chain, mainly because of inadequate infrastructure, lack of refrigeration, and inefficient distribution systems (Nidek et al., 2019).

1.2. Significance and determinants of the food waste problem

Data from the Food and Agriculture Organization of the United Nations (FAO) show that approximately one-third of the food produced globally is wasted annually. By 2022, as much as 1.052 billion tons of food were wasted, of which more than 60% came from households (UNEP, 2024). Most food is wasted in developed countries, with an average of 95-115 kg discarded food per capita per year. In Europe, approximately 88 million tons of food are wasted annually, with households, as in the rest of the world, being most responsible for food waste at 54% (Eurostat, 2024). Food waste occurs throughout the food chain 'from farm to fork' owing to a combination of systemic, logistical, and economic errors, as well as a lack of consumer awareness (Ahmed et al., 2021; Bilska et al., 2015). Many authors

emphasise that consumers are at the heart of food-waste problems (Farr-Wharton et al., 2014; Jakubowska, 2022; Mucha & Oravec, 2025; Neff et al., 2015; Piotrowska-Puchała & Stasiak 2019; Setti et al., 2018). They cite a lack of planning and management of purchases, the purchase of too much food often linked to promotions introduced by traders, or insufficient knowledge of proper food storage and preparation as the main causes of food waste worldwide. A major problem is the misinterpretation of the expiry dates (Aschemann-Witzel et al., 2015; Setti et al., 2018). Consumers often confuse 'use by' with 'best before' labels, resulting in the discarding of products that are still fit for consumption. Wholesome products are often discarded because of visual imperfections (Aschemann-Witzel et al., 2015; Xiao et al., 2024).

Reducing food waste is a sustainable development goal (SDG12.3), according to which global food waste at the retail and consumer levels should be reduced by 50% by 2030 (United Nations, 2017). In Europe, reducing food waste is envisaged in the European Action Plan for a Closed-Circle Economy and the Directive amending the European Waste Framework Directive (Directive (EU) 2018/851). Given this, the issue of food waste has attracted increasing interest from international and non-governmental organisations in recent years as well as from politicians and scientists in various fields (Caldeira et al., 2019; Schanes et al., 2018; Tarczyńska, 2021). Actions related to the reduction and prevention of food waste and its management along the food chain, including public education and promotion of informed consumption, are therefore important. Because the phenomenon of food waste occurs at the highest scale in households compared to other stages of the food chain, a study was undertaken to determine young people's attitudes towards food waste and their socio-demographic and economic determinants. Young people aged 18-35 years were selected as the research group given that young

consumers represent an important segment of market participants whose dynamically changing behaviour and choices determine the quality of future social and economic life (Attiq et al., 2021; Bravi et al., 2020). The following research questions were posed to analyse the issue of FW.

RQ1. What do consumers understand by food waste and what do they think about food waste?

RQ2. What are the factors and causes of food waste?

RQ3. How often and what foods are discarded

RQ4. What actions do consumers take in their households to reduce food waste?

2. Material and methods

A survey using the Computer-Assisted Web Interview (CAWI) technique (Mider, 2013) was conducted in May 2024 using a survey questionnaire generated in Google Forms. A total of 306 individuals, mostly women, participated in this survey. The survey questionnaire consisted of 18 closed-ended single- or multiple-choice questions and six questions characterising respondents by gender, age, place of residence, education, income, and number of people in the household. Respondents' attitudes towards food waste were examined in terms of cognitive, emotional, and behavioural dimensions. The respondents were asked whether they were aware of the problem of food waste, what they understand by the term food waste, what they think about food waste, how important the problem is in comparison with other problems observed in Poland; the impact of various factors on food waste, which entities waste the most food, whether food waste has negative consequences for the climate and the planet, whether the respondents throw food away, and if so, how often, what are the main reasons for food waste in their household, which products they throw away most often, whether and how they reduce food waste in their household, whether they think shops and supermarkets should do

more to reduce food waste, how government action to reduce food waste is rated, whether they use food waste prevention apps such as Too Good To Go or Foodsi, and whether food waste education is important and should be more widely disseminated. The collected data were transferred to Microsoft Excel and coded. Descriptive statistics (% of indications) and Pearson's correlations were used in the analysis. The study was conducted using IBM SPSS Statistics 29.

2.1. Characteristics of the sample of respondents

Most of the survey respondents were women (90%). Their opinions are important because women are primarily responsible for grocery shopping and food preparation (Ahmed et al., 2021; Koivupuro et al., 2012). Of the 306 respondents, more than 78% were aged 19-25 years and 17% were aged 26-35 years. 34% lived in cities with more than 500,000 inhabitants and nearly 21% lived in cities with 100-500,000 inhabitants. The fewest respondents, under 7%, lived in cities with up to 10,000 inhabitants, and just over 19% lived in rural areas and cities with up to 100,000 inhabitants. Nearly 45 % of the respondents were students, 31 % had a university degree, 24 rest had secondary education (24 %) and less than 1 % had primary education. More than every second person (55.4%) had a per capita family income of more than PLN 3000, and nearly 35% had an income of PLN 1501-3000. Less than 10% of respondents had an income of up to PLN 1,500 per person. Among the respondents, one in three lived in a two-person household, more than 21% lived in a family of four, and nearly 18% lived in a single-person household. The smallest number of respondents lived in families larger than four (13%), and the remainder (15%) came from three families.

3. Results and discussion

More than 62% of respondents were found to be "definitely aware" of the problem of food

waste, and 35% "rather aware". Less than 3% of respondents were "definitely" or "rather unaware" of the problem. The respondents' level of awareness was significantly correlated with, among others, opinions on food waste ($r=0.363^{**}$), reasons for food waste in the household ($r=-0.122^*$), willingness to reduce this negative phenomenon ($r=0.237^{**}$), and opinions on the prevalence of education on this issue ($r=0.188^{**}$). Food waste for nearly 78% of respondents was as important as environmental pollution or unequal access to healthcare (75%). For a small percentage of respondents, it was as important as poverty and social inequality (64%), unemployment (55%), and homelessness (54%). For 89%, this problem also has negative consequences for the climate and the planet. The respondents' opinions were significantly related to their views on the relevance of education and dissemination of information on this issue ($r=-0.138^*$). Almost all respondents (> 98%) believed that education on food waste is important and should be further disseminated. Respondents' views were correlated with awareness of the problem of food waste ($r=0.188^{**}$), evaluation of government actions to reduce food waste ($r=-0.343^{**}$), declared frequency of throwing away food ($r=-0.146^*$), willingness to reduce this negative phenomenon in their households ($r=0.399^{**}$), opinions about food waste ($r=0.229^{**}$), opinions about the influence of various factors on food waste, and the entities that waste food the most and household practices related to food purchases. Stefan et al. (2013) also indicated the importance of food waste education, finding negative correlations between awareness of food waste, associated costs, and the amount of food thrown away ($r=-0.14^*$). The state authorities' actions to reduce food waste were not evaluated positively by almost 43% of the respondents, while 19% definitely did not evaluate it positively, and 34% did not. Opinions on this topic were significantly related to, among other things, the gender of the respondents

($r=0.126^*$), their awareness of the problem of food waste ($r=-0.166^{**}$), some reasons for food waste in the household, some shopping behaviour and opinions on the relevance and prevalence of food waste education ($r=-0.343^{**}$).

The largest proportion of respondents understood food waste as throwing away food that was not fit for consumption (40%) and buying excessive amounts of food that was not consumed before the expiry date (38%). Just over 10% of subsumes under the term food waste the non-use of food products because of their appearance, although they are still edible and safe to eat. Due to food waste, 58% of the respondents said they felt guilty about it and tried to avoid it. More than 20% said that food waste is not a priority concern but still tries to avoid it, while almost 17% are fully aware of the problem and actively take action to reduce food waste. Slightly more than 5% of the respondents did not take specific actions to reduce food waste, despite the high importance of this problem.

These opinions were significantly correlated with, among others, the level of awareness of the problem ($r=0.363^{**}$), frequency of throwing food away ($r=-0.297^{**}$), use of food-saving apps ($r=0.146^*$), and opinions on the relevance and prevalence of food waste education ($r=0.229^{**}$). Ahmed et al., (2021) conducted a study on consumer behaviour and knowledge about food waste at the household level in the state of Montana, USA. Almost half of the participants (48%) reported that they were willing to take additional action to reduce food waste. Social factors, such as guilt and setting a good example, have been shown to be greater motivators for reducing food waste than economic and environmental factors. In another US study, consumers cited saving money and setting a good example for their children as the most important motivators for

reducing food waste, while environmental factors, including greenhouse gas emissions, were the least important to them (Neff et al., 2015). In contrast, Attiq et al. (2021) found that consumers' anticipated guilt, awareness of consequences, and environmental knowledge were positively related to intentions to reduce food waste. Respondents were aware that reducing household food waste was a major way to reduce pollution and landfills and was important for conserving natural resources and creating a better environment for future generations.

Food waste is influenced by several factors (Figure 1). According to the respondents, the greatest impact was caused by over-need purchases and food overproduction by the food industry (96% and 68% indications of 'significant impact, respectively). Less frequently "significantly influenced" and "influenced" inadequate food storage and lack of access to educational programs on food waste (62% and 61% of indications, respectively), and much less frequently inadequate cooking skills of respondents (28% of indications).

In their households, the most common reason for wasting food exceeded the best-before date (54% of indications) and was over-purchasing (46%). More than 37% of the respondents indicated that the packaging of the product was too large, 32% indicated that they had no idea how to use the ingredient when cooking and that the portions of the meals prepared were too large, and 24% indicated that the food was not properly stored. The results obtained were consistent with those of other studies (Jakubowska, 2022; Tarczyńska, 2021). Their authors indicated that one of the key factors favouring food discarding exceeds the expiry date of the product and the lack of time to use the food in one's possession, resulting in food going to waste.

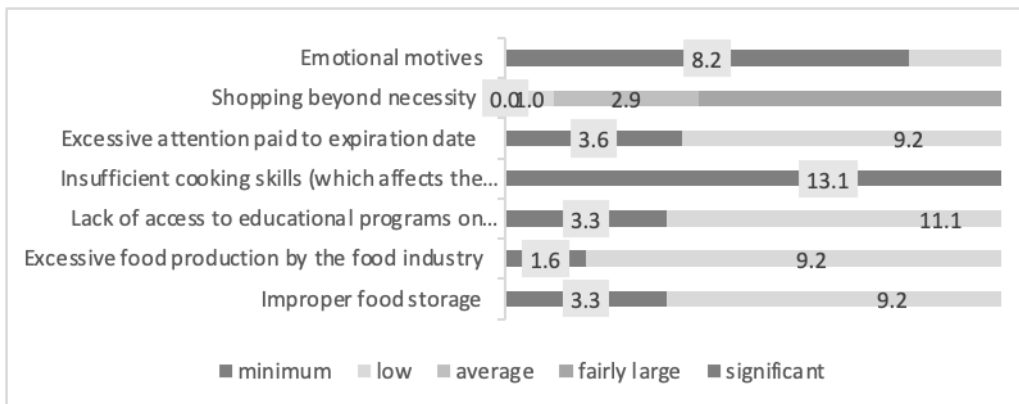


Figure 1. Influence of selected factors on food waste

However, according to Ankiel & Samotyja (2021) poorly planned shopping (i.e. buying unnecessary products) is one of the key factors contributing to food discarding. In addition, the authors point out that during the shopping process, consumers are under the impression that their needs are much greater than they are, which leads them to buy excessive amounts of products. Another reason for wasting food is buying groceries 'just in case' and buying products in large packages (which seems to be more cost-effective). A study of young shoppers in Italy, Spain, and England (Bravi et al., 2020) indicated that in-store shopping behaviour and home food management are important in reducing food waste in all three countries. The majority of participants reported that they were either very interested (48%) or

somewhat interested (36%) in taking additional actions to reduce household food waste; 13% reported that they were somewhat interested, and 4% were not interested at all. The opinions obtained from respondents in the self-report survey were significantly related to the level of awareness of the problem ($r=-0.122^*$), opinions on government action to reduce food waste ($r=0.124^*$), frequency of food discarding, relevance and dissemination of education on food waste ($r=-0.134^*$), and number of people in the household in relation to excessive product packaging ($r=-0.144^*$). According to the respondents, consumers, retail chains, and restaurants waste the most food (85% and 81% of the indications, respectively) (Figure 2).

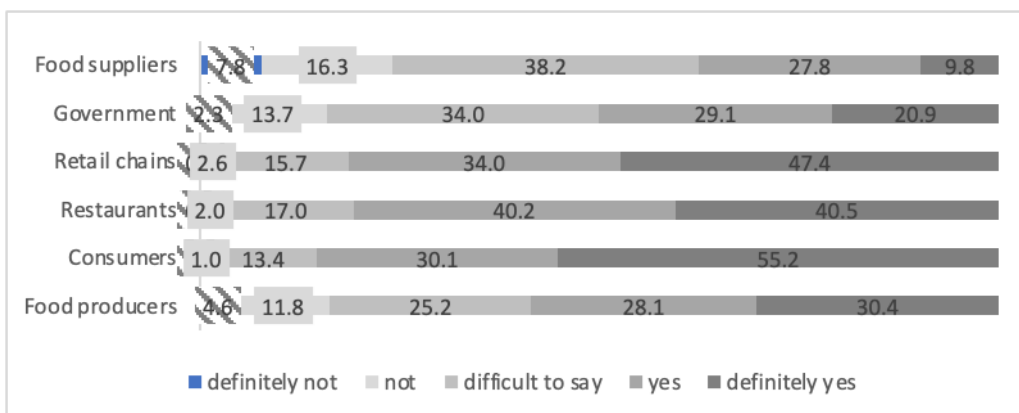


Figure 2. Opinions on food waste (% of indications)

Ninety% of the respondents said that they had happened to throw food away. These opinions were significantly related to the respondents' place of residence ($r=0.124^*$) and their level of awareness of the food waste problem ($r=-0.181^{**}$). For this reason, more than 95% of the respondents believed that they should do more to reduce food waste. Among those who wasted food, suppliers were the least likely to be identified (38%). More than 30% of those surveyed throw away food every day, more than 31% throw away food several times a month, and almost one in five (20%) throw away food once per week. Only 0.4% of participants throw away food less than once per month.

The frequency of food throwing was significantly correlated with opinions on food waste ($r=-0.297^{**}$), opinions on the entities that wasted the most food ($r=-0.132^*$ - consumers, $r=-0.183^{**}$ - restaurants), indicating some of the reasons for food waste, the types of products most often thrown away, and the various actions taken in the household to prevent waste. The most common types of food thrown away were meal leftovers (31% "often" or "very often"), bread (21% "often" or "very often") and fruit and vegetables (18%), and the least common were ready meals (4% of indications "often" or "very often") - Figure 3.

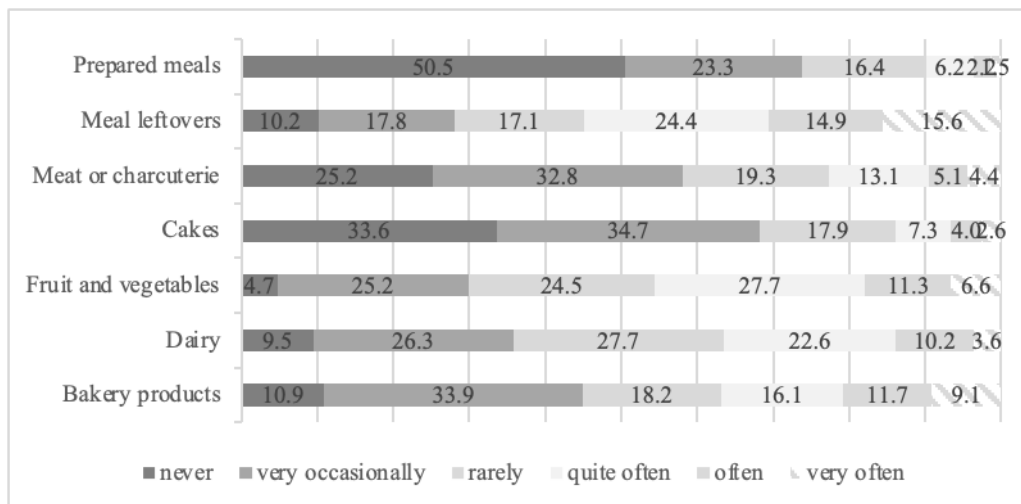


Figure 3. Frequency of throwing away food products (% of indications)

The types of food most frequently discarded were significantly correlated with the frequency of discarding, and in the case of dairy products, with the number of people in the household ($r=-0.134^*$), ready meals with the place of residence ($r=-0.146^*$), and leftovers with gender ($r=-0.127^*$). In a study conducted among students in Poland ($n=318$), the most frequently discarded products were fruits and vegetables (71% of indications), bakery/confectionery products (61%), milk and dairy products (57%), and ready meals and dishes (40%) (Jakubowska, 2022). In

another group of Polish students, a quarter of the respondents threw away bread, and approximately one-fifth threw away vegetables. About 15 % of the respondents admitted to throwing away fruit, milk, and dairy drinks. The least frequently wasted products are eggs (1.49 %), cheese (2.98 %), and meat (6.38 %) (Tarczyńska, 2021). In a study conducted in five northern and western European countries (Denmark, Germany, Norway, Sweden, and the Netherlands) (Aschemann-Witzel et al., 2021), consumers were most likely to throw away ready meals,

fresh fruits and vegetables, bread, and other bakery products, with customers from the Netherlands throwing away most of these products.

At the same time, 97% of the respondents rather or definitely wanted to reduce household food waste. Their declarations were significantly related to gender ($r=-$

0.128*), level of awareness of the food waste problem ($r=0.237^{**}$), opinions on the problem ($r=0.241^{**}$), entities wasting the most food, use of food-saving apps ($r=0.119^{*}$), and opinions on the relevance and spread of food waste education ($r=0.399^{**}$). Respondents took various actions to reduce food waste (Table 1).

Table 1. Frequency of taking various activities to reduce food waste (% indicated)

Activities to reduce food waste	never	very occasionally	rarely	quite often	often	very often
Before I go shopping I check what products are in the house	2.19	3.28	7.66	19.34	24.45	43.07
I check the expiry date of food products in the shop	4.74	7.30	10.58	14.23	24.45	38.69
I go grocery shopping with a list of the products I need	2.19	7.30	10.58	15.69	31.39	32.85
I use what is left over from the previous day, e.g. cooked pasta, rice, potatoes, to prepare subsequent meals	2.92	2.55	8.03	20.80	27.37	38.32
I freeze excess food	5.11	5.84	10.95	21.90	22.99	33.21
Donate unwanted food to food pantries or similar establishments	75.91	10.22	6.20	3.28	1.46	2.92
I am primarily guided by price when choosing products	3.28	10.95	25.18	20.44	25.18	14.96
I buy discounted products with a short shelf life	14.23	16.79	16.79	21.53	16.79	13.87
After the holidays, I throw away some of the prepared and uneaten dishes (e.g. salads, cakes)	22.99	26.28	22.26	14.60	8.76	5.11

Often or very often, 68% of respondents check what products are in the house before going shopping, 66% use products left over from the previous day to prepare a meal, and 64% go grocery shopping with a list of products they need, while in the shop, they check the expiry date of the food they buy. Over 56% of respondents freeze excess food. Almost 14% throw away some of the prepared and uneaten food after Christmas, and only 4% donated excess food to an eatery or other such facilities. In several studies (Aschemann-Witzel et al., 2015; Jakubowska 2022; Setti et al., 2018; Tarczynska 2021; Quested et al., 2013), respondents indicated, similar to the results of our study, that making a shopping list and checking food stocks at the shopping planning stage can reduce the

likelihood of purchasing too much food and preventing food waste. Ahmed et al. (2021) outlined a number of consumer food shopping behaviours that can facilitate the reduction of food waste in households. Most respondents indicated creating a shopping list (65%), checking what is in the fridge and pantry before shopping (65%), planning meals before shopping (50%), sticking to the shopping list (65%), avoiding buying larger packages of food that are likely to be wasted (47%), and avoiding buying more food than necessary due to sales (59%). Ankiel and Samotyja (2021) showed that consumer opinions on the reasons for wasting food vary according to demographic and economic circumstances. Consumers with the lowest education and families with many children

are more likely than other consumers to be motivated by economic reasons and to plan their purchases more rationally. Reasons for food waste related to irrational behaviour were more often indicated by consumers with good material status and representatives of the younger generation. Ellison & Lusk (2018) also showed that consumers' FW decisions vary according to demographic and economic factors, including food prices.

The opinions of respondents in our study were significantly correlated with food throwing frequency, gender, number of people in the household, use of food-saving apps, and opinions on the relevance and prevalence of food waste education. Other studies (Fonseca, 2013; Hwang et al., 2025, Koivupuro et al. (2012) concluded that household size, gender of the person responsible for food shopping, frequency of buying discounted food products, and the respondent's view of the potential to reduce food waste are the main factors influencing the amount of food wasted.

In recent years, one has seen a variety of activities, both civic and undertaken by food entrepreneurs, NGOs, and public administrations, that play an important role in countering food waste. One of these is the European Federation of Food Banks (FEBA) (Czernyszewicz et al., 2022; Priefer et al., 2016). There are also other activities aimed at reducing food waste, including numerous educational campaigns about not wasting food, food pantries, and separate food shelves with short shelf lives (Gonçalves et al., 2025; Mucha & Oravec, 2025). Wiśniewska & Czernyszewicz (2023) point to positive consumer attitudes towards the idea of food sharing, a movement to reduce food waste, and promote sustainability through the redistribution of surplus food. According to Stefan et al. (2013), to change consumer food waste behaviour, efforts should be directed towards providing consumers with tools to deal with their food-related actions. Such a tool is food-saving mobile apps, such as 'ResQ Club', 'Too Good To Go' or 'Foodsi', which aim to reduce food waste by allowing

users to purchase surplus food at discounted prices from restaurants, grocery shops, and other outlets before throwing it away. Apps such as 'Too Good to Go' or 'Foodsi' were used by one in two respondents (50%). App use was correlated with respondents' place of residence, number of people in the household, opinions about food waste ($r=0.146^*$), types of food thrown away, willingness to reduce food waste in their household ($r=0.119^*$), and food shopping behaviour.

4. Conclusions

Based on a survey and analysis of the literature on the subject, it was found that food waste consumers throw away food that is not fit for consumption and buy excessive amounts of food that is not consumed before the expiry date. More than one in two respondents felt guilty about wasting food and tried to avoid it.

Food waste is the result of several factors, including exceeding the use by date, buying too much, or storing food improperly. The results and data analysis confirmed that there was a problem with household food waste. Ninety% of the respondents admitted that they throw away food, including one in three throwing food away daily, one in five times a week, and one-third several times a month. The most commonly discarded food products are leftovers of meals, bread, fruit, and vegetables. Almost all respondents (98%) were aware of the problem of food waste and tried to reduce it through various practices, such as checking before shopping what products were in the house, using the previous day's products, or freezing excess food. Despite this, there is a strong need to educate consumers about the effects of food waste and how to prevent it. Information campaigns that promote responsible consumerism or implement more efficient food storage methods can make an important contribute to reducing the scale of food waste.

There is a need for continued research to better understand consumer behaviour. Food

waste is a complex issue requiring the cooperation of consumers, businesses, and legislators. Concerted actions, including active public policies and educational campaigns on food stewardship, are needed to prevent food waste.

In an era of high internet accessibility and technology, apps that help both consumers and food businesses save food can be very helpful. Examples include Too Good to Go and Foodsy, which aim to reduce food waste

by allowing users to purchase surplus food from restaurants, grocery shops, and other outlets before throwing it away. In addition, educational campaigns on planning how much to eat during holidays, storage techniques, and providing recipes for using leftover Christmas food in new dishes can make a significant contribution to reducing waste. It is also important to promote outlets such as food pantries, where consumers can donate excess food to those in need.

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