



Exploratory analysis of food waste causes in Romanian households

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ABSTRACT: Reducing food waste became a priority in the past decades for the majority of nations around the world. But while the interest in this topic is high, not all countries, including Romania – our case study- accurately estimate household food waste quantities. Determining the reality of food waste at household levels is highly valuable because in the end, it can bring insight into what would be the best methods to reduce waste and optimize resource consumption. The current study determined the causes, quantities, and main components of food waste in Romanian households by applying and subsequently analyzing a food waste survey. Our purpose was to determine not only how much food Romanians throw away per week, but also what type of food. In addition, by studying the households' consumption habits we identified the main behavioral triggers of food waste. By applying the survey to a relevant sample of our country's population, we obtained a relatively accurate depiction of food waste attitudes among Romanian consumers and our paper can be a starting point in developing an educational tool aiming to reduce food waste in households. This type of study is important not only for informational reasons but also from a societal standpoint. As a complex community, part of larger international structures and agreements, (such as the European Union, the United Nations, or The Paris Agreement on Climate Change), Romania needs to align itself with the other partners in order to decrease the negative impact on the environment of food waste.

Key words: household, food waste, causes, Romania, questionnaire.

Análise exploratória das causas do desperdício de alimentos em lares romenos

RESUMO: A redução do desperdício de alimentos tornou-se uma prioridade nas últimas décadas para a maioria das nações ao redor do mundo. Entretanto, enquanto o interesse nesse tópico é alto, nem todos os países, incluindo a Romênia - nosso estudo de caso - estimam com precisão as quantidades de resíduos de alimentos em domicílios. Determinar a realidade do desperdício de alimentos em níveis domiciliares é altamente valioso, porque no final pode trazer para o que seriam os melhores métodos para reduzir o desperdício e otimizar o consumo de recursos. O presente estudo teve como objetivo determinar as causas, quantidades e principais componentes do desperdício de alimentos em lares romenos, aplicando e subsequentemente analisando uma pesquisa sobre desperdício de alimentos. Nosso propósito foi determinar não apenas o quanto de comida os romenos jogam fora por semana, mas também qual tipo de alimento. Além disso, ao estudarmos os hábitos de consumo dos domicílios, identificamos os principais gatilhos comportamentais do desperdício de alimentos. Ao aplicar a pesquisa a uma amostra relevante da população de nosso país, obtivemos uma representação relativamente precisa das atitudes de desperdício de alimentos entre os consumidores romenos e nosso artigo pode ser um ponto de partida no desenvolvimento de uma ferramenta educacional voltada para a redução do desperdício de alimentos em domicílios. Esse tipo de estudo é importante não apenas por razões informativas, mas também do ponto de vista social. Como uma comunidade complexa, parte de estruturas e acordos internacionais maiores, (como a União Europeia, as Nações Unidas ou o Acordo de Paris sobre a Mudança Climática), a Romênia precisa se alinhar com os outros parceiros para diminuir o impacto negativo no meio ambiente do desperdício de alimentos.

Palavras-chave: domicílio, desperdício de alimentos, causas, Romênia, questionário.

INTRODUCTION

In the past decades, a growing concern regarding the environmental impact of human activity has become apparent, and researchers needed to put a number on the negative impact of pollution and resource wasting. The common thread of this impact, the greenhouse gas emission by sector, has thus become the standard in quantifying how much a certain human activity impacts the overall quality of the environment. According to recent studies (CRIPPA et al., 2021, CRIPPA

et al., 2022), the food sector is responsible for a third of the total global greenhouse gas emissions. By itself, this number is not concerning, because, with a continuously growing world population, the food systems become more and more complex and extensive. The issue becomes problematic when taking into account the fact that a very large part of the food system ends up wasted.

Most recent data regarding food waste estimates that roughly one-third of the entire food fit for human consumption is either lost or wasted worldwide (GUSTAVSSON et al., 2011). About 931

million tons of food per year end up in the trash, out of which 61% happens at the household level.

A growing interest in food waste generated by households was observed in the past two decades, with studies being published on this particular topic by numerous researchers from various areas of expertise. A recent analysis identifies that the psychological aspects of the problem (such as behaviors, influencing factors, and environmental influence on one's behavior) are prevalent when discussing the attitude towards admitting food waste and actually taking action to reduce it. (SCHANES et al., 2018). Even though there is an obvious connection between sociodemographic characteristics and food waste quantity, routines, and particular behaviors which determine in the end the structure and the quantity of household waste. (STANCU et al., 2015).

The UN Food Waste index report for 2021 (The UN Food Waste index report for 2021) states that Europe is responsible for 9.5% of the worldwide food waste, Europe being a region where this particular problem is very well researched and documented, so an accurate number is easily associated with the phenomena. While there are numerous studies on this subject and despite the fact that The European Union has stressed the importance of reducing food waste, still, 55% of the total waste is currently represented by food waste in Europe. The European current target is set at halving food waste by 2030 by developing and implementing common policies across the Union. While part of the EU, Romania has not made available until today any official statistics regarding the total quantity of food waste but several international bodies offer some estimation on Romania's food waste numbers. The World bank determined by conducting several measurements at disposal sites that 56% of the total Romanian waste is represented by food/organic waste [World Bank Data Catalog]. UN estimated a quantity of 61 kg/per capita/per year food waste for Eastern Europe (The UN Food Waste Index Report for 2021), while for Romania the estimated value was 70 kg/per capita/per year. According to the UN, the quantities of food waste in Romania are 1.35 million tones in households (65%), 495 thousand tones (24%) in Food Service Estimates and 248 thousand tones (12%) in Retail Estimates. However, these numbers are merely estimates because no official statistics or proper Food Waste studies were available for Romania.

In light of this lack of data for Romania, the current study discovered the main causes of

food waste in Romanian households, gathering details about the behaviors that today lead to large amounts of food waste, and putting an estimation on the quantities of discarded food. Additionally, we gathered data about food waste-reducing behaviors and availabilities which coupled with the results on causes and quantities could represent a starting point for policymakers to start working on a legal framework and developing solutions for reducing the total amount of food waste. We identified several Romanian research teams that approached this subject but from different perspectives. POCOL et al. (2020) approached consumer segmentation based on their behaviors, DUMITRU (2020) determined a slight decrease in food waste compared to 2016 by following up on the 2016 study. In 2021, the same author but with a different team (DUMITRU, 2021) studied the impact of food waste along the food supply chain, and what are the pressure points that need to be pushed in order to reduce the waste quantities. While others focused on the theoretical and informative part of the issue, we also have research that tries to determine the viability of a solution for directing food waste to compost (GHINEA, 2019). Also in a more practical approach we have research that considers redirecting food waste towards repurposing (FRONE & FRONE, 2017), the impact of food waste on the environment (COSTULEANU, 2016) and the clear routes that the consumer can take to avoid food waste (STEFAN et al., 2012)

While all the aforementioned studies focus on food waste causes and quantities and bring important value to the topic, the present paper is the first post-pandemic study with a representative sample that analyses food waste at the household level in Romania. It is beneficial to understand how today's consumers perceive and react to this topic and which behaviors could be curated in order to reduce overall food waste.

METHODOLOGY

There is no generally accepted definition of food waste (CALDEIRA, 2017) or an agreed-upon methodology among scientists as being the best when trying to study food waste (VAN HERPEN et al., 2019). For the purposes of this study, we chose to relate to FAO's definition that identifies food waste at the household level as the total quantity of a certain type of product not eaten and discarded, without taking into account the packaging but including non-edible parts such as shells, bones, or peels (GUSTAVSSON et al., 2014).

Our focus is on households' food waste and this in itself determines a lower level of accuracy because at household levels, most often the quantities are self-determined and self-reported. This leads to less accurate data especially because people do not pay enough attention to how much they actually throw away and tend to diminish the actual situation.

After considering various methods such as questionnaires (GIORDANO, 2018; PONIS et al., 2017; AKTAS, 2017), food or kitchen diaries (KOIVUPURO, 2012; WRAP, 2019), focus groups and interviews (WRAP, 2011) or photographs (VAN HERPEN, 2019) we decided upon using a questionnaire for collecting our data. Our study was deployed at the beginning of 2022. Answers were collected both online and face-to-face, and participation was voluntary. 509 of the questionnaires received were valid and the answers were the basis for our detailed research.

In setting up the survey we wanted to gather the following details:

1. *Socio-demographic data* – such as age, gender, education, family status, occupation, household size, and income levels. Except for age, which each person filled individually, all other questions had predetermined answers.
2. *Open-ended question* – to identify the current perception of the food waste problem among our respondents.
3. *Set of questions to identify the current consumption habits.* For each question we set predetermined answers, to which in our analysis we attributed values from 0 to 4/5/6 (depending on the answers). As a subset, for this part, the most sustainable behavior would get a minimal score – 0, while the behaviors that tend to increase food waste get a score of a maximum of 22 points.
4. *Set of questions to quantify the amount of food waste generated by the household.* For this question, they had to choose for each type of product the discarded quantity in the last 7 days. For the analysis, we worked with a scale from 0 to 5, where a minimal total showed low amounts of wasted food, while a maximum total showed high quantities of food waste. The maximum score for this section is 60.
5. *Question that identified the main cause for food disposal in the household.* The respondents were asked to attribute values from 1 (Highly frequent) to 5 (Extremely rare) to the main reasons for throwing food away in their family.
6. *Question that identified the main means of food disposal.* Respondents were asked to attribute

quantities of total disposed of food for the past 7 days for each food disposal option provided.

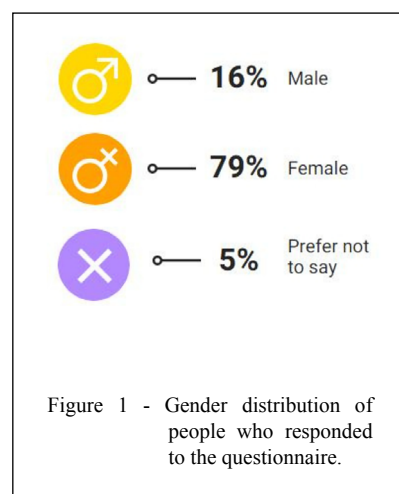
7. *Affirmations to identify positive or negative behaviors in relation to food waste.* For these questions, we used a Likert scale from 1 to 5 where 1 is “Strongly disagree” and 5 is “Strongly agree”. The focus was to identify the behaviors that impact the end result of food waste by targeting the most common food practices and routines such as planning, shopping, cooking, storing, eating, and dealing with leftovers (SCHANES et al., 2018).

Using the above methodology, we focused on the following objectives for the study:

- Identifying the main causes for generating food waste at the household level;
- Identifying wasteful behaviors and availability to correct such tendencies;
- Correlation analysis between wasteful behavior and sociodemographic profiles;

RESULTS

When deploying the survey we focused on finding various groups that in the end would be accurately representative of Romanian households in general. While we selected our sample from all social categories, age-wise we focused our study more on young people because their habits will shape future developments in food waste volumes. Depending on their availability to curb wasteful behavior, food waste quantities will drop or not. Also, while an almost equal number of men and women were invited to fill out our survey, women were more receptive and open; therefore, their number is larger. Even though 79% of the respondents were female (Figure 1), this does not affect the overall study results because in Romanian



households as well as in other European countries (PONIS et al, 2017), usually, the women are in charge of food/household management. Regarding income levels, most of our participants (42%) declared their household income as being between 1000 EUR and 2000 EUR per month (Figure 2). Millennials (48%) and X Generation (29%) comprised the majority of our sample (Figure 3). Our survey gathered data from all social environments and as a result, we had representation from all types of educational backgrounds. However, respondents who last graduated from a higher form of education – a bachelor's degree or master's degree – represented 68% of the total while only 29.4% only graduated high school or less. (Figure 4). Most of our respondents are part of a marriage or civil partnership (Figure 5) couples with (33%) or without children (26%). Multigenerational families that include 2 or 3 generations are also a common occurrence not only among our sample (Figure 6) but in Romania as well. The latest statistics (STANCIU, 2017) place the percentage of atypical households at 30.2% to which our sample matched with only a small difference (32%).

Taking into account the sociodemographic characteristics, we analyzed current shopping behavior. As stated in the methodology section of this paper, the maximum score for shopping habits was 22 points.

We considered wasteful behavior the following patterns: shopping in more than one place for food, often going out to eat at restaurants or takeaway, shopping on-site instead of online, rarely cooking, and making shopping trips often. On the opposite end, a lower score in wasteful behavior indicates cooking often, eating out less, and condensing shopping trips to fewer places as rare as possible.

After finding each respondent's score, we averaged it by generation. As figure 7 shows

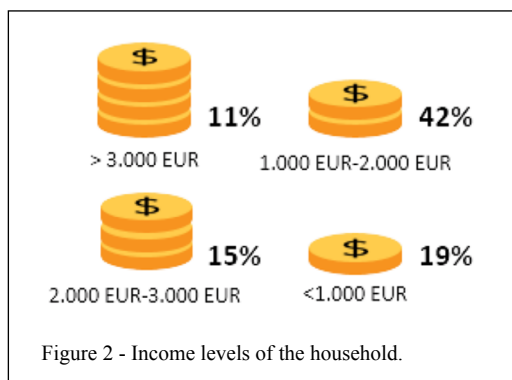
below, our findings lead us to conclude that younger generations exhibit more wasteful behavior than older ones. The score lowers on average by each analyzed age category. As people grow old, the sum of their total behavior is geared towards reducing the waste of resources. Previous studies (TUCKER & FARRELY, 2015) also concluded that the higher the age, the more environmentally and socially conscious people became when considering food waste.

Education levels had no discernable effect on the average wasteful behavior score. The average score was similar regardless of education. The slight spike in high school graduate's scores (Figure 8) can be explained by the fact that in this category the large majority of people are young (almost 55% of people in this category were Gen Z), and as we previously saw, young people are prone to generating more food waste than older people.

We also noticed that households with children tend to have a higher score, especially due to more shopping trips and going out to eat frequently. Especially single parents tend to score higher on average; we assume this happens because of a lack of time and higher demands from their little children. Also, since their household is not big, either single people with children or single people without children tend to order takeaway more often, cook less and tend to do more shopping trips.

The biggest discrepancies are in the divorced category. Divorced people with children order more food or eat out, do more shopping trips and generally have a more wasteful behavior. Conversely, divorced people without children exhibit the most "green" behavior regarding waste. They tend to keep to their self, minimizing going out for social meals or shopping trips. They cook more and do all the shopping in one place (Figure 9).

Considering income, we determined that the lower the household income, the higher the chances for frugal behavior. People with low incomes exhibited less wasteful attitudes and behaviors, while those with high-income levels tend to waste more (Figure 10). Still, people with households earning more than 3.000 EUR per month (more than 10 times the minimum wage in Romania) scored slightly less than the ones earning between 2.000 EUR and 3.000 EUR, so we can assume that with their wealth increase, their awareness also increased, but not by much. The upper echelons in terms of income are not highly preoccupied with budgeting, and because of this, wasteful behavior is more present than in households where money is more of a restriction.



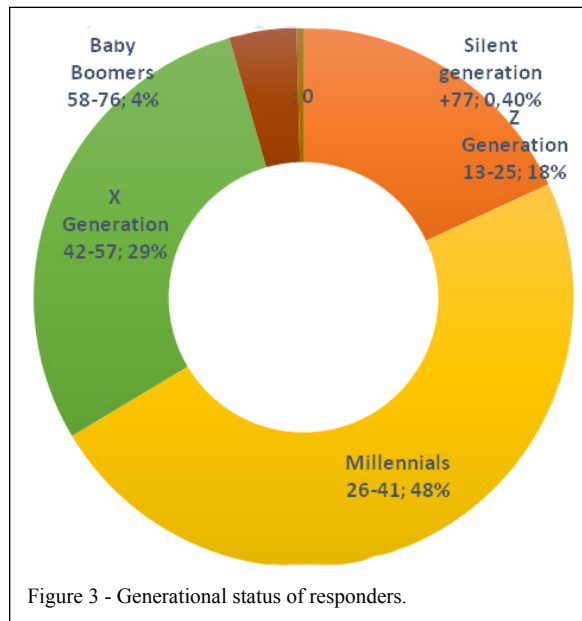


Figure 3 - Generational status of responders.

After gathering the socio-demographic data of the responders and asking about where they shop and how often, we wanted to observe the real perception of our peers regarding food waste, without guiding their responses. This open-ended question aimed to gauge the perception of the “food waste topic” among Romanians and identify more accurately what is their main concern on this topic.

The answers resulting from the individual analysis of the responses to this particular question were quite interesting. The general consensus was that food waste is a bad societal attitude that not only negatively impacts society and the environment, but most of all the individuals’ households. However, the majority of responses indicated that food waste is highly present despite its negative impact.

The largest share of the responses indicated that people believe that the main cause of food waste is buying more than the household needs. Roughly, 35% of the people that answered our survey detailed in various terms that excess shopping leads to food being thrown away. Even though buying food is in its own bad management of finances, some people identify the problem as overall bad management of the household. As such, they regard food waste to be the effect of bad meal preparation, bad portion sizes, bad pantry/fridge management, and lack of organization for the times that they need to eat outside of the home.

Lack of education regarding the ways to reduce food waste or lack of awareness on what are the damaging effects of food waste on the

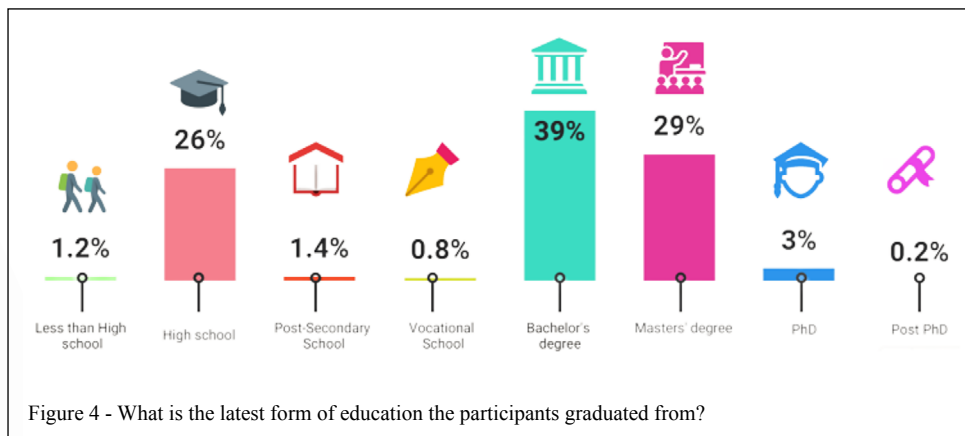
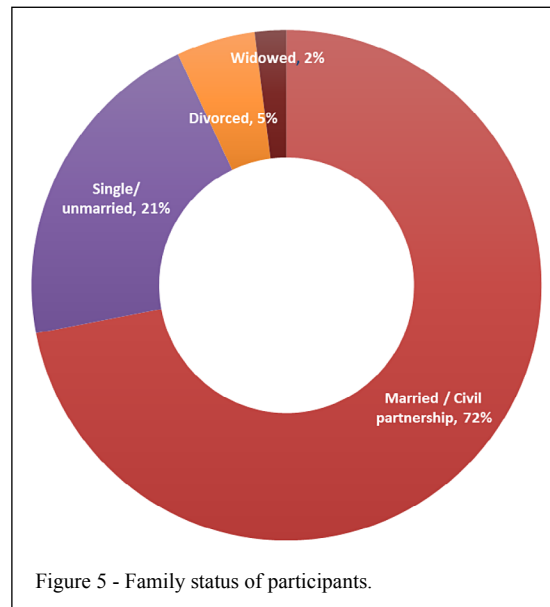


Figure 4 - What is the latest form of education the participants graduated from?

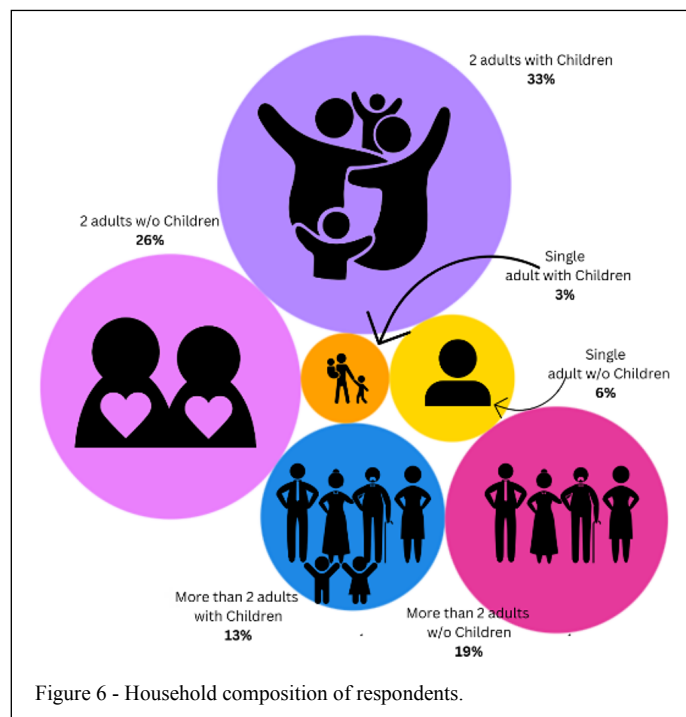


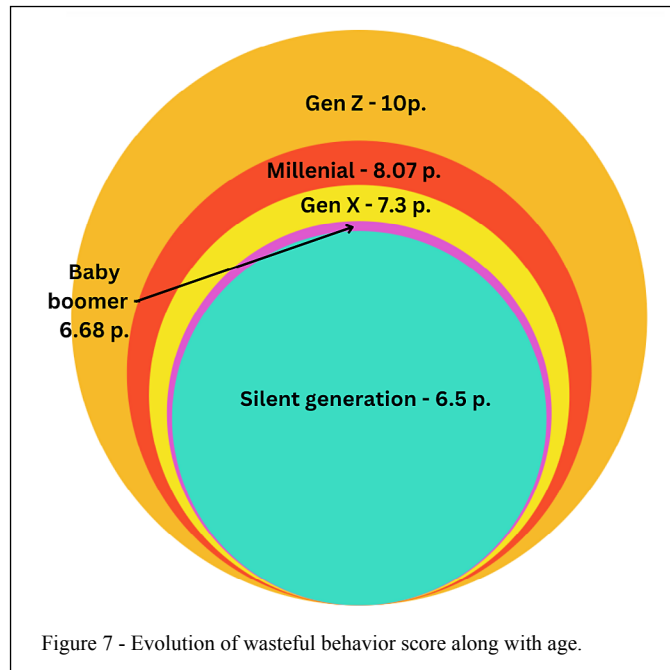
environment and on the society is also a valid reason for large quantities of wasted food.

We were surprised that some people identified social standing as a cause for food waste. Meaning that some people buy more than they can consume just to show. They buy more food on special occasions like Christmas or Easter, to impress their visitors or even their social media followers. We found

that some responders realize that society also influences the individual's habits regarding their lifestyle or meal choices. The perpetual busy schedule that does not allow time for cooking, the social pressure of eating at restaurants, or the fact that they don't eat the same meal twice are increasing the wasted quantities of food.

Many Millennials and even Gen Z people in Romania heard while they were young the phrase

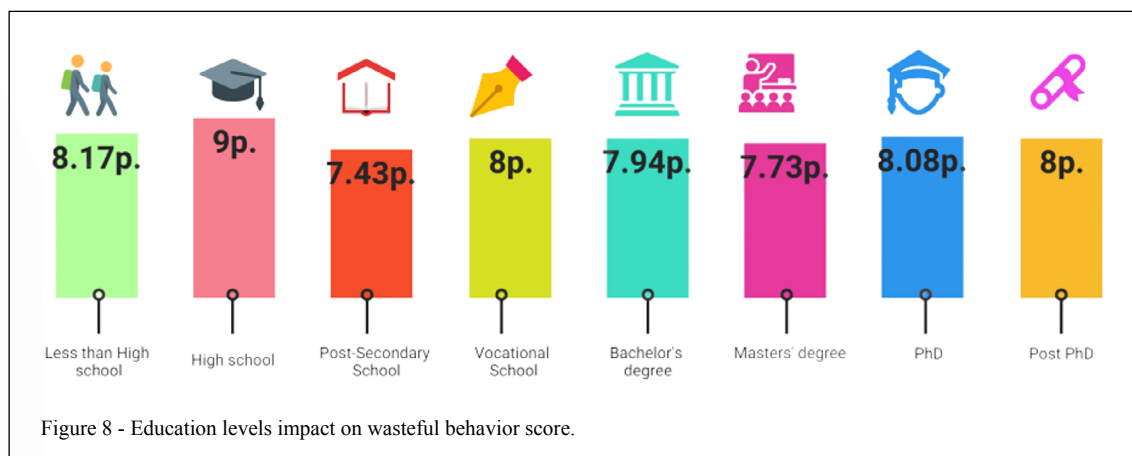


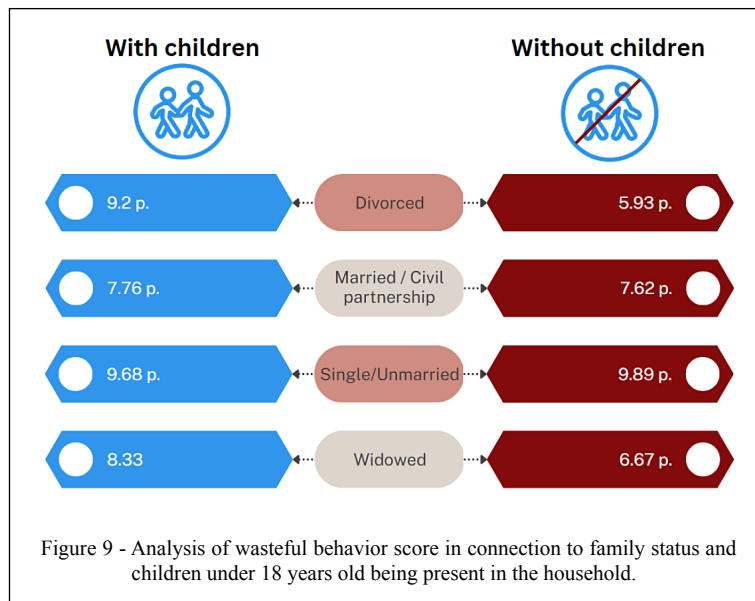


“Eat all your food from the plate because there are other people who are starving, so you should be grateful that you have enough”. This way of thinking led to nowadays adults repeating the same concept, so for them, wasting food is bad because other people do not have enough to eat. In addition, from this perspective, some people identify food waste as a problem, not as “our problem” but more as “their problem”, for example, children in third world countries that do not have enough food not necessarily in Romania.

We also observed a cynical view of some responders declaring that food waste is a combination

of greediness, negligence, lack of respect for others’ work, lack of environmental awareness, and plain disregard for the bad effects of food waste. They tended to blame those that waste food because they believe that they do it malevolently out of pure selfishness. In addition, there are quite a few that place the blame entirely on other players. The producers produce too much and throw what it’s not “up to standard”, the supermarkets throw a lot of food that expires or fresh products that turn bad after a few days, the media manipulate us into consuming what we don’t need or the government that does not work to put in place policies for



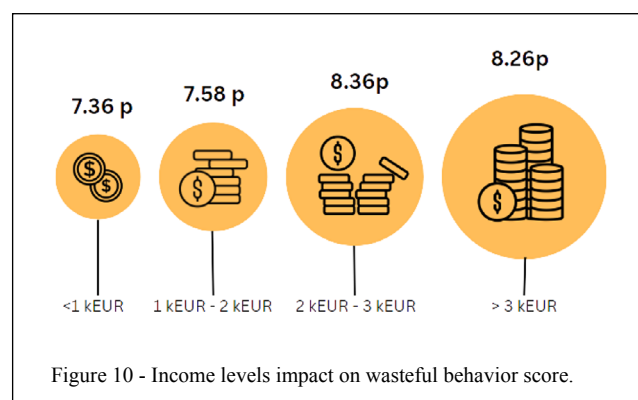


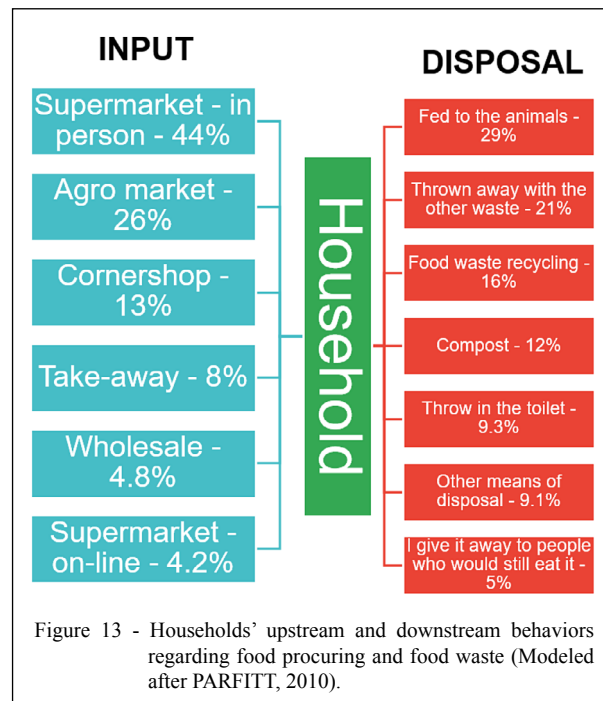
stopping food waste. It's everybody's fault but our own. Not to mention the very few who believe that there is no food waste problem or who consider that food waste is an urban problem, and just because in the rural areas the food is not actually thrown in the garbage but feeding the animals, they don't see it as food waste.

A word cloud picture (Figure 11) of the most used words in connection to defining food waste clearly shows that Romanians associate food waste with buying too much food, with excess, and with financial irresponsibility.

But once inside the household, why do people decide to throw away food? We presented them with 5 predetermined answers and 1 open-ended answer if they felt the need to add extra causes and represented the results in figure 12.

We can conclude it is very likely that food is usually thrown away when expired or spoiled. However, while "I don't like it anymore" is not usually a reason to discard food, we postpone eating that food until sometimes it's too late to eat it because it goes into the "Expired food" or "Spoiled food" category. The main reason for expired or spoiled food is definitely overbuying groceries, which usually stems from poor financial planning of household budgets. In turn, poor financial planning is the effect of lackluster education at societal levels regarding finances, household management, and the resulting effects of these topics on household welfare. The basics of household management when talking about food shopping is making shopping lists. Here we encountered quite a paradox. Even though more than 60% of the respondents stated that they usually shop with a list, that they check the fridge and





the category that has the biggest chance to improve their shopping habits. Reducing the shopping points and the number of trips can reduce mindless shopping and overbuying, which in turn will reduce waste. Increasing awareness in households on how to plan for, cook, and how to store food will lower the chances of food being mishandled. Right now there are no official programmes aiming to educate the population about the benefits of resource management in households. Whatever information is passed onto kids in school is sterile and lacks the tools that need to make it attractive to learn and to apply. In a similar fashion, interventions downstream could decrease the quantities that are simply thrown away. Offering sustainable solutions to dispose of food waste in neighborhoods, especially in urban areas would significantly reduce pollution and remove problems like stray animals (issues in this case are caused by feeding the animals scraps).

CONCLUSION

While food waste is difficult to eradicate, we need to credit our responders with the fact that they understand its negative impact and agree that solutions to this problem need to be found. As was the case with similar studies conducted (STEFAN et al., 2012) we also determined that routines and individual behaviors are key to reducing food waste.

Unfortunately, as is the case with other nations, not only Romanians, everyone feels that solutions need to be found, but by others, not necessarily by them, not even at the household level. Very few people said they actually take active measures to reduce their food waste behavior.

Poor household planning and bad financial management have a cascade effect by overspending on groceries and buying items that will eventually end up in the trash. Coupling this with a lack of proper education regarding the prevention of food waste and the ways to decrease pollution caused by food waste, we have a major issue at a societal level easily observed not only locally but also on a larger scale (GRIFFIN, 2009).

Increasing awareness and education should be our government's top priority because it would solve the root cause of food waste not merely the effects. A better understanding of the cause-effect relationship of our behaviors would lead to better lifestyle management and would decrease mindless shopping sessions.

Also, there are numerous programs conducted by public and private organizations with the specific aim of reducing food waste in Romania but we did not see a very poignant concern with recycling and selective collection of waste in our country. Dumitru and team (DUMITRU, 2021) came upon the same conclusion we did, that a better

communication on this segment would lead to greater visibility of these programs and more people to adhere to reducing pollution caused by food waste.

As part of the UN, Romania set in its 2030 Agenda objectives that will need improvements in the Food waste sector in order to be achieved. We are talking here mainly about clean waters and integrated waste management objectives. These two objectives on the 2030 Agenda state the fact that Romania needs to reduce the waste quantities and needs to learn how to better recycle and dispose of the waste. The country will not only need to manage better the problem of landfill sites but will need to educate people on how to reduce waste, how to properly recycle, and how to redirect food waste towards compost where possible.

Understanding why people waste food is only the beginning. Our society will need to further intensify its knowledge on this topic to find solutions that will reduce food waste in the long term, especially because this is a growing problem. By 2050, we will need to have figured out how to feed 9.5 billion people while weathering the negative effects that climate change will have on agricultural yields (UN, 2013). Our paper is merely a stepping-stone today. The team is currently engaged in further studying the food waste problem in Romania and is looking toward sustainable models from other countries that can be efficiently applied in Romania in order to reduce food waste along the food supply chain.

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DECLARATION OF CONFLICT OF INTEREST

The authors declare that there is no conflict of interest to declare for carrying out this study.

AUTHORS' CONTRIBUTIONS

All authors contributed equally for the conception and writing of the manuscript. All authors critically revised the manuscript and approved of the final version.

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