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# WASTE IN THE FOOD CHAIN - THEORETICAL BACKGROUND AND PRACTICAL ASPECTS

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## ABSTRACT

Food waste is a problem that is particularly relevant in the twenty-first century. According to the data from the Food Banks every year 1.3 billion tons of food is wasted in the world. This represents a third of the total food production. On the other hand, in sub-Saharan Africa and Asia the scale of waste is much lower and there is a chronic problem of malnutrition or even starvation. At the same time a large part of the population of the EU (including Poles) declare that they are not aware of the situation, do not notice information campaigns and programs that aim to reduce food waste. Struggle with the problem of the twenty-first century should therefore start from the building of attitudes and awareness of individual households and firms engaged in producing and distributing of food. The purpose of this article is to point to the problem of food waste, its causes and manifestations, and to identify possible strategies to combat this phenomenon. The literature review will be supplemented by own research of authors in the field of food wastage in households in Poland. The conclusions from the analysis will be compared with the available data to confirm or reject the universally and widespread opinions on the consumer behavior. Methods used in the work include a critical analysis of the literature and meta-analysis with the elements of deductive reasoning as well as a questionnaire survey of selected group of respondents.

## KEYWORDS

food, loss, waste, reasons, counteraction, consumer behaviour.

## 1. INTRODUCTION AND PURPOSE

The definition of food waste refers to the reduction of its weight, which results from irregularities in the transport, distribution, storage and processing of food for the purposes of consumption in the household and catering establishments (Federation of Polish Food Banks, 2013). Food wasted means the food discarded outside the agri-food chain from the economic reasons, aesthetic or due to the approaching date of consumable, which, however, is still suitable for consumption or may be intended for human consumption. But, because of its inability to be used, food is allocated to disposal or recycling (Kwasek 2016). Food waste is one of the most important problem of the twenty-first century. 1.3 billion tons of food is wasted every year in the world, ie. 1/3 of the total production (but even more than 40% in Canada and USA). In Europe it is 100 million tons (c.a. 30%) with the average value of the loss of 179 kg/year per capita (but in the Netherlands up to 579 kg) and consumers are the main responsible for this state of affairs. For comparison, in Poland the average person wastes about 235 kg of food per year, which means a loss of 9 million tons in the national scale (Barilla Center for Food&Nutrition 2012). With this result, Poland is in 5th place in the European Union in terms of food waste, after UK, Germany, France and the Netherlands. On the other hand, in sub-Saharan Africa the losses amount to only 11 kg/person/year (Food Banks 2015). This information is illustrated bitter paradox. While 1/3 of the food produced is wasted, hundreds of millions of people in the world suffer from hunger and malnutrition.

One of the major causes of food waste is present in society the idea of consumerism, launched back in the eighteenth century in England. Buying goods and services is today the focus of a man - the consumer. In a sense, it has become the meaning of existence, replacing the job. Consumerism has become almost a religion, where the large shopping centers are the place of worship. The man currently derives satisfaction from

making a purchase and choice of goods or services, and not from the necessity to meet basic needs (Goodwin et.al. 2008). At the same time consumer preferences resulting from the unified tastes created the premise for the creation of a homogeneous global market. The beneficiaries of this process are mostly global players producing standardized products worldwide. World is engulfed by peculiar consumer race, people buy more than they need, and the consequences of this are, among others, loss of food and food waste (Śmiechowska 2015, p. 90).

The aim of the paper is to point to the problem of food waste, its causes and manifestations, and to identify possible strategies to combat this phenomenon. The literature review will be supplemented by own research of authors in the field of food wastage in households in Poland. The conclusions from the analysis will be compared with the available data to confirm or reject the universally and widespread opinions on the consumer behavior.

## 2. REASONS OF FOOD WASTE

There are many causes that determine the irrational functioning of the food market and use of food. They occur throughout the food chain "from farm to table". As indicated in the research carried out by Stenmarck et.al. (2016, p.4) the total volume of food waste in the 27 European Union countries is the result of activity of: households (53%), processing and production (30%), food services (12%) and retail and wholesale (5%) Therefore, a key position in the process of food wasting is played by households or consumers. The most wasted products belong to the following groups : cereals (25%), fruits and vegetables (19%), roots and tubers (17%), meat (11%), fish and seafood (11%), milk (7%), oilseeds and legumes ( 4%) (Dabrowska and Janoś-Kreslo 2013, p.19). The first place for the "cereal" comes from the fact of ejecting the large quantities of stale bread, which is the basis of the European diet.

The problem is food waste is also widespread in Poland. According to research conducted by Millward Brown SMG/KRC in 2012, 30% of respondents declare that they throw out food. Groceries are more often thrown out by people working and living in large cities (Dabrowska and Janoś-Kreslo 2013, p.19). The main premise of food waste is related to the exceeded expiry date (indicated by more than 50% of respondents), which may result from the purchase of excessive quantities of the products (such response occurred anyway in the study as a separate answer indicated by 22% of respondents), and which in turn is a manifestation of consumerism mentioned in the introduction. The more that the expiry date on the food labels is one of the most important piece of information sought by European consumers (The European Food Information Council (EUFIC) 2011). It can be therefore believed that customers are aware of the expiry term of the purchased products.

Over 30% of respondents declared improper storage of food as a basis for food wasting. It is very significant because we have today a wide access to a specialized technical equipment (refrigerators, freezers) and the packaging allow to keep food fresh for a longer period. The cause may therefore be due to the poor quality of food products (as pointed out by every fourth respondent), which spoil despite the provision of adequate storage conditions. It is, among others, the effect of the mass production of food corporations seeking to minimize manufacturing costs. Traditional methods of prolonging foods "life", such as smoking, salting, drying, fermentation, have been replaced by cheaper methods of preserving product. Meanwhile, studies of the Department of Meat Technology and Quality Management of the University of Life Sciences in Lublin confirm the effectiveness of traditional methods of preservation (Dolatowski and others 2011).

Among the other causes, not mentioned in the study, we could indicated a very low level of knowledge on the phenomenon and the lack of educational programs that discuss the issue. Without awareness among citizens it will be hard to change their attitude to the "food management", including planning of purchases, storage, cooking and portioning. It is finally noted that the paradox may be also the result of socio-economic status and culture of a country, e.g. a habit of preparing larger amounts of meals for receptions and meetings.

In a somewhat lesser extent than at the household level food waste occurs at the production stage. In the food industry waste refers to the massive throwing of products with the close term before the expiration date. This is due to mismatch between the date of finishing the production process and the date of receipt of the finished product by the customer. On the other hand, it is very important to plan the policy of purchasing the raw materials, as those having inadequate quality and staying to long in the storage can not be used. Errors can also occur in the situation of absence of systematic control of the equipment and maintenance. Whereas,



such activities should be included in the management system of production companies, as well as activities related to quality control, hygiene and waste management, wastewater treatment etc., which reduce the losses in the food processing. However it should be noted that part of the loss in production is actually inevitable, much waste is inedible or results from technical issues that lead to overproduction or creation of deformed or damaged goods (European Commission 2010). The point is to minimize these losses and to ensure that they do not arise from human error.

Less than 15% of wasted food is created by the services sector, mainly bars and restaurants. The problem is primarily associated with too large portions of the ordered meals, as well as too large portions of the served dishes (as evidenced by bigger plates or "XL" offer). The losses also result from a mismatch between the offered meals and customers' needs (this is particularly evident in the case of tourist facilities and the so-called "all inclusive" offers).

One of the manifestations of globalization and the associated development of consumerism is the dynamic development of commercial facilities. Stores must guarantee a wide assortment of goods, which meet certain conditions, eg. the color, size or shape. Products, which are not compatible with the specified parameters can not get on the shelves. Sellers therefore face the logistical challenges, including inventory management: anticipating demand and correct storage, meeting expectations regarding product quality, or coordinating transactions between different sectors. On the level of warehouse the risk refers to the mechanical damage and spoilage of goods, which is caused by the consumption date expiration. Other hazard is associated with the inadequate temperature for specific products. Moreover, storage policy should be conducted in a way which ensure the continuity of sales. Unused, overestimated delivery contributes in fact to increase the amount of wasted food. Recipients (stores) can also refuse to accept the goods from the manufacturer due to the failure of strict requirements - losses occur then at the distribution stage (Krajewski, Kołożyn-Krajewska and Wrzosek 2014 s.852).

### 3. RESEARCH METHODOLOGY AND RESULTS

In order to determine the knowledge and behavior of Polish households in terms of food waste authors conducted a survey in the period of January-February 2017. The study involved 179 people, mostly full-time and part-time students as well as employees of a large company. Selection of research sample was intentional and resulted from a personal access to the respondents making it more possible to get a reliable answers (questionnaires were distributed directly by the Authors and all doubts were clarified during the study). The authors are aware of the fact that the results obtained can not be used to generalize the conclusions for the whole population, because the people surveyed had at least a high school education and moreover they are generally younger people (mainly between 20-30 or 31-40 years). Therefore it can be concluded that they are more aware of the problem and their behavior could differ from the social group with the lower level of education and older generations. On the other hand, the respondents differ in characteristics such as place of residence, income and number of people in the household, which will differentiate the behavior of consumers for these variables. The following table presents the basic characteristics of the research group.

Table 1. Characteristics of the research group (data in %).

Sex	Age (years)	Place of residence (number of residents in thousands)	Monthly net income per capita (PLN)	Number of persons in household
Male: 32 Female: 68	<20: 6,7 20-30: 50,8 31-40: 22,9 41-50: 12,9 >50: 6,7	Village: 34,1 Town <5: 11,2 Town 5-20.: 19,6 Town 21-50: 10,6 City 51-100: 12,8 City >100: 10,6	>500: 2,8 500-1000: 25,1 1001-1500: 29,1 1501-2000: 15,6 >2000: 24,6	1: 3,4 2: 15,1 3: 26,8 4: 32,4 5: 13,4 6 and > : 8,4

Source: Own study.

According to the results of the survey 97% of respondents declare that they are aware of the problem of food waste. However, only one in three asked the correct answer (ca. 30%) to the question of what percentage of food is wasted in the world. 27% of surveyed answered “40%”, 21% - “50% and more”, and on the other hand 9% indicated “about 20%” and less than 6% signed a response of “ten percent and less”. Such results may suggest that, despite the declaration, the level of knowledge about the phenomenon is low, as confirmed by previous conclusions.

More than 56% of respondents say they are wasting food in their household, which is a lot more than in the previous mentioned studies by Millward Brown (30%). As the results show, food waste is higher in more wealthy households, with fewer users and living in middle and large cities (see table 2). When it comes to the amount of wasted food, the highest percentage of respondents (43%) indicated a response of “5-10%”, and every fourth person indicated a response “below 5%”. Every fifth respondent gave the answer "11-20%" and every eighth – "21-40%" (nobody signed “40% and more”). Taking into account the fact that in European countries the average level of food waste is 30% and households are responsible for about half that amount (about 15%), the results obtained in the group are lower than the above mentioned. This may indicate a higher awareness of the problem among the examined persons or overestimating of the general statistics.

Table 2. Percentage of respondents wasting food according to the criterion of place of residence, income and number of persons in household.

Place of residence (number of residents in thousands)				Monthly net income per capita (PLN)				Number of persons in household			
Village and town < 5 th.	Town 5-20 and 21-50 th.	City 51-100 th.	City > 100 th.	1000 and less	1001-1500	1501-2000	More than 2000	1-2	3	4	5 and more
42%	63%	70%	79%	52%	48%	71%	61%	73%	56%	60%	36%

Source: Own study.

Expiration of date for product consumption is the main cause of food waste in the surveyed group (almost 39% of indications) which confirms the general data. Next places involve: preparing too large meals (as answered by 26% of respondents) and purchasing too much food (18%). Compared to general data low percentage of respondents (only 6% against 22% in Millward Brown survey) pointed out improper food storage as a reason of food waste. Among the remaining responses “spoilage of food due to law quality” was indicated by 4,5% of respondents and “no idea to use ingredients” by 7,1%.

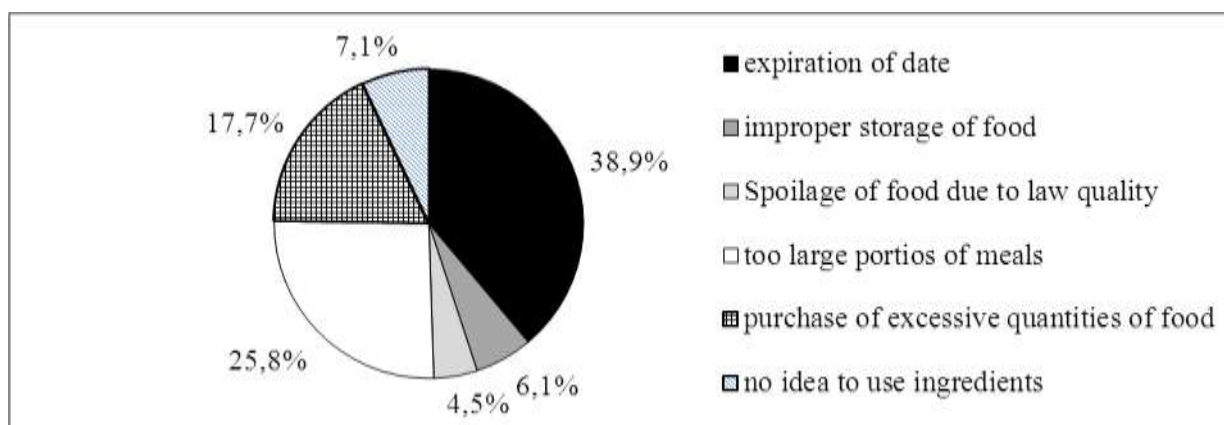


Figure 1. Causes of food waste in the surveyed group.

Source: Own study.

As in the literature studies the group of products most often thrown out includes cereals, mainly bread and bakery products (32% of responses). Relatively high positions refer to milk and dairy products and meat, respectively 27% and 22%, whereas fruits and vegetables make up 19%. When asked "Do you take any action to reduce household food waste?" majority of the respondents answered affirmatively (85%). Among the most frequently undertaken actions were: purchasing less amount of food, proper food storage and preparing smaller portions of meals.

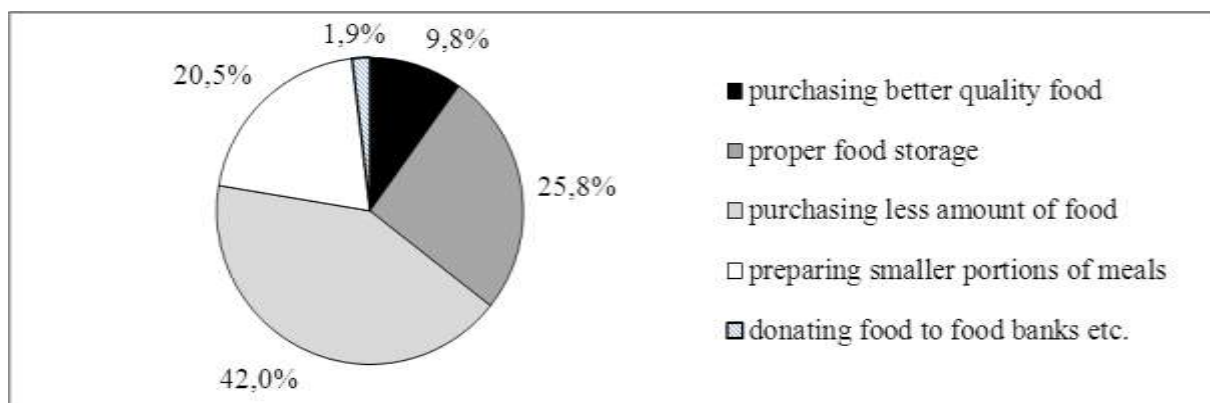


Figure 2. Action to avoid food waste among respondents.

Source: Own study.

### 3. CONCLUSION

Literature studies and own research prove that food waste is a great problem in the contemporary world, especially in high-developed countries. Despite growing awareness of the phenomenon, the scale of food throwing is still high. Bad habits of food consumption, storing and preparing meals are fixed in rich societies and it will be difficult to change them without proper top-down actions. These should include, among others, information campaigns and educational systems raising public awareness of the causes and negative consequences of food wasting and indicating ways to counteract the problem. Another options may refer to the food redistribution programs, which allow to reduce the price of articles with an upcoming expiry date, modify food standards (e.g. fruit and vegetables) to make it easier to sale of "less aesthetic" products, tax reliefs for food donated for charity or alternative purpose (e.g. biofuel industry, animal feeding (Kwasek 2016). Finally, the key to countering the loss and waste of food may include the strategy called "sustainable consumption and production" (SCP) which is becoming increasingly popular in recent years as a component of the "green economy".

### REFERENCES

- Barilla Center for Food&Nutrition, 2012. *Food waste: causes, impacts, and proposals*, Parma.
- Bilska B., Krajewski K., Kołożyn-Krajewska D., Wrzosek M., 2014, *Ryzyko powstawania strat i marnotrawstwa żywności a możliwość ich ograniczenia*, Komitet Nauk o Żywności PAN, Warsaw.
- Chrzanowska B., Śmiechowska M., 2015. *Próba określenia przyczyn marnotrawienia żywności w gospodarstwach domowych na przykładzie pieczywa*, „Stowarzyszenie Ekonomistów Rolnictwa i Agrobiznesu, Roczniki Naukowe”, Vol. XVII, Issue 2.
- Dąbrowska A., Janoś-Kresło M., 2013. *Marnowanie żywności jako problem społeczny*, „Handel Wewnętrzny”, No. 4 (345).
- Dolatowski Z.J. et.al., 2011. *Ekologiczne metody przetwórstwa mięsa i wyrobu produktów mięsnych bez stosowania dodatków azotanów i azotynów z uwzględnieniem wydłużania trwałości przechowalniczej tych produktów*, Uniwersytet Przyrodniczy, Lublin.

- European Parliament, 2011. *Report on how to avoid food wastage: strategies for a more efficient food chain in the EU* (2011/2175(INI)). Committee on Agricultural and Rural Development, Brussels.
- FAO, 2011, *Global food losses and food waste: extent, causes and prevention*, Rome.
- FAO, 2013. *Food Waste Footprint. Impacts on Natural Resources*, Rome.
- Federation of Polish Food Banks, 2013. *Preventing food waste for the benefit of society* (report), Warsaw.
- Food Banks, 2016. *The scale of food waste*, <http://bankizywnosci.pl/> (access date: 26.03.2016).
- Goodwin N., Nelson J.A., Ackerman F., Weisskopf T., 2008. *Consumption and the consumer society, Consumption and the Consumer Society*. Global Development And Environment Institute – Tufts University, Medford.
- Gosiewska M., 2013. *Nie marnuj żywności – myśl ekologicznie*, „Przemysł Spożywczy”, No. 9(67).
- Jastrzębska-Smolaga H., 2000. *W kierunku trwałej konsumpcji. Dylematy, zagrożenia, szanse*. PWN, Warsaw.
- Komisja Europejska, 2010. *Preparatory study on food waste across EU 27*, Brussels.
- Krajewski K., Kołożyn-Krajewska D., Wrzosek M., 2014. *Ocena strat i marnotrawstwa żywności w obiektach handlowych a działania strategiczne handlu – wyniki badań; Etnocentryzm konsumencki na rynku produktów żywnościowych. Stan i perspektywy rozwoju*, „Marketing i Rynek”, No. 6.
- Kwasek M., 2016. *Zrównoważona konsumpcja żywności sposobem na zmniejszenie marnotrawstwa żywności* (presentation). Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej, Jachranka.
- Marnowanie żywności – fakty*, <http://niemarnuje.pl/marnowanie-zywnosci.html> (access date: 29.03.2016).
- Pogroszewska M., 2016. *Darowizny od przedsiębiorców na cele charytatywne a skutki podatkowe w VAT, PIT i CIT*, [www.rp.pl](http://www.rp.pl) (access date: 11.01.2016).
- Polska Akcja Humanitarna, 2016. *Przyczyny głodu*, <http://www.pah.org.pl> (dostęp: 29.03.2016).
- Stenmarck Å., Jensen C., Quested T., Moates G., 2016, *Estimates of European food waste levels*, Swedish Environmental Research Institute, Stockholm.
- Szubierajska J., 2016. *Marnowanie żywności, to nie tylko problem społeczny czy ekonomiczny*, [www.ekologia.pl](http://www.ekologia.pl) (access date: 10.01.2016).
- Śmiechowska M., 2015. *Zrównoważona konsumpcja a marnotrawstwo żywności*. „*Annales Academiae Medicae Gedanensis*”, No. 45.
- [The European Food Information Council](http://www.eufic.eu) (EUFIC), 2011. *Forum n° 5 – Consumer response to portion information on food and drink packaging – A pan-European study*, Brussels.
- UNICEF, 2016. *Głód na świecie- najważniejsze dane*, <https://www.unicef.pl/> (access date: 29.03.2016).