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FOOD WASTE IN THE WORLD AND IN POLAND

According to the United Nations, 1.3 billion tonnes of food, one third of which would be edible, is being wasted worldwide. In Europe alone, around 89 million tonnes of food are being wasted. 178 kg of food is thrown out per inhabitant of the European Union every year. In Poland annually, according to reports of the Federation of Polish Food Banks, they waste about 235 kg of food per capita, which places Poland in 5th place in relation to food throwing away in Europe. Throughout the country, Poles waste 9 million tons of food. Food wastage is not only referred to as a phenomenal aspect, but also as an economic, social and energy aspect, as well as influencing the environmental aspect. At every stage of the food chain there is a responsibility for food waste, which is why it is necessary to take action to limit these losses.

Key words: waste, food, prevention, waste, safety.

За даними Організації Об'єднаних Націй в усьому світі викидається 1,3 млрд т продуктів харчування, одна третина з яких є їстівною. Тільки в Європі викидається близько 89 млн т їжі. Щорічно на одного жителя Європейського Союзу викидається 178 кг їжі. У Польщі щорічно, згідно з повідомленнями Федерації польських банків продовольства, викидається близько 235 кг продовольства на душу населення, що ставить Польщу на 5-те місце в Європі щодо продуктів, які викидаються. По усій країні поляки витрачають 9 млн т їжі. Нераціональне використання харчових продуктів має не тільки феноменальний аспект, але й економічний, соціальний та енергетичний аспект, а також впливає на екологічний стан суспільства. На кожному етапі харчового ланцюга є відповідальність за харчові відходи, тому необхідно вжити заходів для обмеження цих втрат.

Основною проблемою харчових відходів є труднощі з протидією їм, що, зокрема, зумовлено різними причинами цього явища, економічними, соціальними та політичними конфліктами. Багаті країни втрачають більше їжі, що пов'язано з економічними причинами (мешканці таких країн заробляють більше і купують більше їжі, яку вони, на жаль, викидають). Люди в бідніших країнах не мають можливості купувати велику кількість їжі або вони не мають можливості виробляти продукти, які б задовольняли їхні потреби, тому втрачають набагато менше їжі. Важливим кроком у боротьбі з харчовими відходами та мінімізації харчових відходів є вжиття різних заходів для підвищення обізнаності споживачів. Вони повинні купувати необхідну їм кількість їжі, а не купувати їжу для так званої пропозиції. У даний час багато говориться про витрачання їжі, але, на жаль, мало що робиться для зменшення харчових відходів. У кожній країні світу необхідно вживати заходів щодо втрати харчових продуктів. Надання надлишкової їжі бідним і малозабезпеченим людям зводить до мінімуму проблему з харчовими відходами.

Ключові слова: відходи, продукти харчування, профілактика, відходи, безпека.

Introduction

Based on the definition of the Food and Agriculture Organisation of the United Nations food security is the continuing situation in which all people have free physical, economic access to safe,

nutritious and sufficient food to meet their nutritional needs and ensure the appropriate development of an active and healthy life. By emphasising the aspect of food safety, we understand the absence of any biological, chemical or physical contamination that could in some way endanger human health (Kołożyn – Krajewska et al 2014).

In the 21st century, a particular problem on a global scale is the heterogeneous standard of living of people, which affects the lack of sufficient amount of money needed to buy food of sufficient quality and quantity. In highly developed countries, overconsumption is at the forefront, and in developing countries, people are struggling with barriers such as hunger and malnutrition at a slow pace. The best way out of this situation is to maintain cooperation between the demand and food supply, due to allegedly arising in both directions of irregularities leading to undesirable phenomena. The large amount of food that rotates on the market results in excessive waste of food and food raw materials that could be used in consumption (Kołożyn – Krajewska et al 2014).

Because of the incoherence of the food chain, which consists of many stages and a complex structure, running processes based on the course and management of food is a huge challenge. Errors that occur in the growth of the weight of goods that are marketed and within the distribution and logistics chain, increase the scale of food waste and loss worldwide. This is evident at all stages of the food chain, from primary production, processing, trade, gastronomy, distribution to households (Kołożyn – Krajewska et al 2014).

A study carried out by EUROSTAT in 2014 in 28 countries belonging to the European Union shows that the total amount of waste generated in households and economic activities was 2503 million tonnes. This was the highest amount of waste recorded between 2004 and 2014. (https://ec.europa.eu/).

According to reports by the Food and Agriculture Organisation of the United Nations, around one third of the food produced is wasted worldwide. Translating this data into the amount of mass losses is as much as about 1.3 billion tons of food that could be used for consumption. Around 89 million tonnes of food is wasted in Europe, which corresponds to 20 - 30 % of the total weight of food purchased, where almost 67 % would be fit for consumption (Kołożyn – Krajewska et al 2014). Around 179 kg of food is thrown away per inhabitant of Europe each year. In sub-Saharan Africa and Southeast Asia, food wastage losses range from 6 to 11 kg per person per year (Gustavsson et al 2011). The largest amount of food wasted in Europe is the responsibility of each of them: The Netherlands 579 kg/os/year, Belgians 399 kg/os/year and Cypriots 334 kg/os/year. The least food is wasted in Greece 44 kg/os/year, in Malta 62 kg/os/year and in the Czech Republic 71 kg/os/year (Kołożyn – Krajewska et al 2014). It is noted that approximately 235 kg per capita in the year is wasted in Poland (https://www.pap.pl/). At all stages of the food chain there is a responsibility to in order to reduce food wastage, action should therefore be taken to reduce food wastage. An action plan can be drawn up to reduce food wastage, with sufficient knowledge of how to generate losses. Documents produced by the European Union call on Member States to reduce the generation of food waste. at all stages of the food chain. This is complemented by efforts, which are linked to the Europe 2020 strategy. In a communication issued by the European Commission on resource efficiency, the Commission went into a paragraph on the need to reduce food waste. On 19th January 2012 the European Parliament adopted a resolution on a strategy to increase the activity of the food chain. In this resolution the European Parliament asked the European Commission to adopt concrete projects and measures aimed at reducing food waste by 50% by 2025 (Kołożyn – Krajewska et al 2014).

The disadvantages of wasted food are not only ethical aspects but also the final handling of food waste. The effect of excessive production of waste is the emission of methane, dangerous for the health of

organisms. Literature data show that food distribution and processing are responsible for the formation of greenhouse gases. Another factor influencing the harmfulness of the environment is the use of water and energy (Food Statistics Pocketbook. 2012).

Consequences of food wastage and losses

The issue of wasted food does not only cover the scale of the phenomenon, but also influences the economic and social aspects of the project, as well as the following for the energy and environmental aspects.

When it comes to the economic aspect, money losses are important, affect their businesses throughout the food chain and these losses arise from a financial loss for a product produced, transported and intended for sale. The use of wasted food obliges you to bear the costs associated with its processing, disposal to landfill and fees or preventive measures. Attention should be paid to the financial costs incurred, which are the result of workload, purchase of raw materials, operation of machinery and equipment, maintenance of health security system or use of natural resources. In global terms, the deficit is around USD 750 billion a year, and geographically, Asia is the continent leading the way (48%). Products that the financial losses incurred are, to a record-breaking extent, vegetables, meat, fruit, cereals and milk (FAO Summary Report 2013). The hasty use of food, apart from quantitative losses, means a great danger to the environment and entails too much use of natural resources, which affects global warming. This is an obstacle to the sustainable development of the food sector on a global scale. The issue of wasted food includes not only the format of the phenomenon and the ethical approach, but also the management of waste in the future. In addition to the known aspects, care should be taken to ensure that the increase in the total mass of food that is thrown away does not entail the need to use a high percentage of organic and inorganic waste (food packaging). As a result, the production of waste leads to methane emissions into the environment. Expert literature reports that elements of food processing and distribution are responsible for one fifth of greenhouse gas intake. The amount of food waste generated as a result of food wastage in the 27 EU countries in 2008 means 170 million tons of CO2 greenhouse gases into the atmosphere and accounts for 3% of total gas emissions from the EU countries. Less than 45% of emissions - 78 million tonnes equivalent - are caused by unreasonable household activities. The actions carried out prove that if we reduce the waste of food that is still edible by 1 tonne, it can lead to a reduction in greenhouse gases by 800 - 1400 kg of CO2 (Bernstad, Andersson 2015). Another determinant, which has a negative impact on the loss and waste of food on the environment, is the mass of unused food of the water used for its production. It is estimated that the amount of water lost with food is about 250 km3 per year for the whole world. The raw materials with the highest water demand throughout the food chain are cereals, water, meat, milk and vegetables. It is said that there are about 5-10 thousand litres of water per 1 kg of beef (Food Statistics Pocketbook 2012).

Food wastage not only generates financial losses but also irreversible losses of energy that could be consumed. In relation to the incurred losses of calorific value can be given in the following order: cereal products - 52%, root vegetables The following products are available: edible oils - 8%, meat - 7%, milk and milk products - 4%, fish and seafood - 1%. On a global scale, the largest amount of energy losses in kcal are responsible for: South Asia, which is industrialized - 28% and South-East Asia - 24%, North America, Oceania - 14% and Europe - 14% (Kołożyn – Krajewska 2016).

Foods wasted in the Word

According to a 2013 FAO report, the world's population is being thrown away every year. 1.3 billion tonnes of food. This is 1/3 of the amount of food that has been produced and is suitable for consumption. The amount of this food would make it possible for Poles to be fed by at least 66 years of age. Around 100 million tonnes of food are wasted in the European Union. An average European throws around 20 to 30

% of food in the bin, two thirds of which would be fit for consumption. Consumers (53%) and processors (19%) generate large amounts of waste from wasted food (Raport Federacji Polskich Banków Żywności 2018).

The problem of food wastage is important in efforts to combat hunger, increase wages and improve food security in the poorest countries in the world. The cause of food losses is the lack of food security for poor people, the deterioration of food quality and food safety, economic development and environmental protection. The real causes of food losses vary throughout the world and depend to a large extent on the specific conditions and local situation in a given country. Food losses will essentially be influenced by: crop production, decisions and models, internal infrastructure and production capacity, trade chains and distribution channels, as well as purchasing, consumer activities and how food is used. Regardless of the degree of economic development and sophistication of systems in a country, food losses should be kept to a minimum. Food wastage means wasting production resources such as land, water, energy and means of production. The production of food that is not consumed leads to unnecessary CO2 emissions as well as to a loss of the economic value of the food produced (http://www.fao.org/).

Avoiding food losses that could have been avoided from an economic point of view has a direct negative impact on the incomes of both farmers and farmers. and consumers, as farmers live on the margins of food insecurity. Given that many small farms remain at the margins of food security, reducing food losses could have a direct effect on and the significant impact on their livelihoods. For poor consumers (who are in a situation of food insecurity or vulnerable households), the priority is, of course, to ensure access to nutritious, safe and affordable food products. Food insecurity is often more a question of access (purchase and price of food) than just a problem with stocks. Increasing the efficiency of the supply chain can help to achieve the following objectives, reduce food costs for consumers and thus increase their availability. Due to the magnitude of food losses, profitable investment in reducing food price losses may be one of the means of reducing food prices, which would of course require that financial gains from smaller losses are compensated for by smaller losses. However, this would undoubtedly require that the economic gains from the reduction in losses are not offset by their costs (http://www.fao.org/).

As there is no uniform definition of food waste in the European Union, the European Parliament has proposed to reject food products for economic or aesthetic reasons or due to the imminent expiry date, which are still fully fit for human consumption and can be used by humans and which, in the absence of their possible use as substitutes, with negative externalities, in terms of environmental impact as well as economic costs and lack of revenue for companies (Borowski et al. 2016).

Food losses and waste in the agro - food chain

Within the agri-food chain, food is wasted or lost in the agri-food chain, from agricultural production, through post-harvest treatment and storage, processing, distribution and consumption. In the case of developing countries, food shortages are the most common consequence of insufficient resources in the early stages of the food chain (agricultural production, processing and storage), mainly due to a lack of high-tech agricultural production, use and storage of preservatives, inability to store food products efficiently, inefficient infrastructure and lack of sufficient food storage capacity to ensure sustainable development. The greatest damage in the agricultural production phases was recorded in Latin America (13.4%) and sub-Saharan Africa (12.5%), in the final processing and storage of crops grown in sub-Saharan Africa (12.7%), South Asia and South East Asia (9.6%). Most food in industrialised countries is wasted at the level of consumption and distribution. In North America and Oceania, the largest amounts of food waste were recorded at the level of consumption (12.6%), which is related inter alia to food overproduction, market price mechanisms and the administrative and legal

framework, non-compliance with these due to poor consumer eating habits and lack of respect for food (Borowski et al 2016).

Food losses in the European Union

Studies commissioned by the European Commission show that around 89 million tonnes of food are wasted per year in EU countries and around 180 kg per capita (Barilla Center For Food and Nutrition. 2012). By comparison, in sub-Saharan Africa, food thrown out per capita per year is 6-11 kg. The largest amount of food is wasted by British people, as much as 14 million tons, in households as much as 8.3 million. Poles waste about 9 million tons of food, where production is responsible for wasting about 6.6 million tons of food waste, then households - for about 2 million tons and other sectors - for about 0.4 million tons (Borowski et al 2016).

In the countries of the European Union, the degree of food wastage per capita varies greatly. The smallest amount of food is thrown away by the Greeks only 44 kg a year, and the largest amount of food is thrown away by the Dutch as much as 579 kg. The degree of food wastage above 100 kg per inhabitant is distinguished by as many as eleven countries of the European Union: Romania, Slovakia, Denmark, Germany, Portugal, France, Italy, Lithuania, Spain, Hungary and Finland (from 105 kg in Romania to 193 kg in Finland). The scale of food wastage in Poland was estimated at 235 kg per capita per year. In terms of food waste, Poland is seventh after Great Britain, Ireland, Estonia, Cyprus, Belgium. and the Netherlands. The highest amounts of wasted food are in the household sector - 42%, of which 2/3 were avoided, i.e. about 76 kg per capita per year. Complexity of factors influencing the level of food waste in households is responsible for 39% of the total amount of food wasted, the food supplier, including restaurants and catering chains emissions vs. 14%, and retailers and retail chains - for 5% (European Commission 2011).

Food wasted in Poland

Every year 9 million tons of food is wasted in Poland. The Polish Parliament is working on a draft law to reduce the scale of waste, following the example of other EU countries. In Poland, there is no comprehensive scientific research on food waste and waste, which would cover all groups of food products and every stage of the agri-food chain. General estimates for the European Union can only be found in foreign publications (Bräutigam, Jörissen, Priefer 2014).

Food losses along the agro - food chain

The research methodology used made it possible to identify those points where In Poland in 2007 and 2011, the biggest losses and food waste took place.

From the analysis of estimations of losses and waste of particular groups of food products in relation to the stages of the agri-food chain, it was stated that the share of meat was 6% (Borowski et al 2016), that about 40% of losses and wastage are caused by agricultural production. In the analysed period, the share of agricultural production in the generation of food losses and food waste decreased by 2.8 percentage points in favour of the remaining stages of the agri-food chain, i.e. consumption, processing, processing, post-harvest processing, storage and distribution (Borowski et al 2016).

Taking into account the amount of losses and wastage in the examined groups of food products, differences can be observed at individual stages of the agri-food chain in which they occur. The highest share of tuber and root vegetables in 2011 was 58.6%, and of cereals - the lowest 4.0%, which is a result of lower water content in seeds, which significantly improves resistance to harvesting, post-harvest treatment and cereal storage, as opposed to other groups of plant products. In the case of animal products, losses and waste in the agricultural production phase are lower than in the case of plant products. On the basis of the final analysis of the phase of the agri-food chain, i.e. consumption, it was found that the share of the examined groups of food products in the production of losses was diversified. and waste. At the consumption stage, losses dominate, especially meat waste, where their share in 2011 was 41.9% (42.7% in 2007). At this stage of the agro-food chain, cereals have a high percentage of losses and waste

among products of plant origin (in 2011 - 54.1%, and in 2007 - 56.0%) (Borowski et al 2016).

The share of agricultural production in the production of losses and wastage of cereals, vegetables and fruit, meat, fish and seafood increased between 2007 and 2011, while the share of other food products, i.e. root vegetables also decreased and tubers, oilseeds and legumes, milk and eggs. Reverse dependence was found at the end of the agri-food chain, i.e. at the level of consumption. Taking into account the amount of food losses and wastage in Poland as a whole, in 2007 10 893 thousand tons were produced, in 2011 10 675 thousand tons, i.e. 2% less. In quantitative terms, food waste and losses decreased in the audited period only at the stage of agrarian production - from 4640 thousand tonnes in 2007 to 4245 thousand tonnes in 2011, i.e. by 8.5%. In all other phases of the agri-food chain, food losses and wastage increased: in the consumption phase (by 3.7%), post-harvest treatment and storage (by 3.3%), distribution (by 2.3%) and processing (by 0.6%). The analysis of losses and wastage of specific groups of food products in Poland showed that the highest losses and wastage in 2007 affected root and tuber vegetables - 3757 thousand tons (in 2011 - 2868 thousand tons) of fruit and vegetables - 3400 thousand tons in 2011. (2,932 thousand tonnes in 2007), the lowest sum of the seafood bill (51 and 57 thousand tonnes) (Borowski et al 2016).

Food losses per capita

After converting the generated losses and food wastage into the number of Polish citizens, the amount of food wastage was obtained in kilograms. per capita. Estimates show that total losses in 2007 were as follows emissions and food waste amounted to 285.2 kg per capita, and in 2011 - 285.2 kg per capita. This means that the loss of food and waste over the period under consideration was reduced by 5.8 kg per capita. Analysing the losses emissions and food waste at the various stages of the agri-food chain were found to have decreased by 9 kg per capita at all stages from agricultural production to distribution, while at the consumption stage they increased by 3,2 kg. (Borowski et al 2016).

Taking into account the results of the research, it should be remembered that these are only estimates, which are burdened with a huge error. Official ways of collecting data and assessing the amount of food losses and food waste in European Union countries, including Poland, will also be taken into account until official methods of estimating food losses and losses in the European Union and also in Poland are applied. Measures are currently being taken to present a unified system for the control of food waste and disposal in the European Union. In June 2016, the Council of the European Union adopted the results of the FUSION project, including the development of a uniform and specific EU monitoring protocol concerning the measurement of food waste and reduction of losses (Rada Unii Europejskiej 2016).

Food losses in households

Polish Food Banks provide data on the problem of food waste in Poland. Therefore, attention should be paid to the issue of not meeting the demand for food in Polish households. According to the Central Statistical Office (GUS) survey, in 2014, households with a level below the extreme poverty line (below the social minimum) were inhabited by about 2.8 million people, but households with expenditure below this line, which do not exceed 50% of the average expenditure outlays in all households in Poland, i.e. about 6.2 million people. It is estimated that the number of people below the statutory poverty threshold is about 4.6 million (GUS 2015).

In the CBOS analysis of Poles' declaration on food wastage, Poles were asked how many times food is thrown away in their homes and what action should be taken to counteract it. According to the survey:

- one in four people admit that they have thrown food away in their home over the last seven days;

- young people (pupils and students) admit to throwing away food; adults find it more difficult to admit to poor food management;

- 94% of people aged 65 and over, as many as 88% of people who consider their material conditions as bad, as well as 93% of people with primary or lower secondary education or secondary education declared that food is not thrown away in their homes;

- throwing away food is more likely to affect richer people with higher education and managerial positions;

- the most common food products thrown away are vegetables, fruit, bread and food waste;

- Polish people throw away much less food than in 2005, but for most product categories (sausages, meat and meat products, milk and milk products, vegetables, fruit and fruit products) it is more than in 2000 (Komunikat z badań nr 115. 2016).

Despite the fact that the Federation of Polish Food Banks conducts many information and promotion campaigns, including the information campaign «Don't waste food» since 2009. Ecologically oriented thinking towards manufacturers and consumers of food products is an increase in the scale of discards of food products in 2012 and 2014. In 2014, Polish customers discarded 21 p.p. of fruit more than in 2012, 13 p.p. of cold cuts, 12 p.p. of bread, 7 p.p. of yoghurts, 7 p.p. of milk, meat and cheese - 5 p.p. and 1 p.p. of vegetables, while 5 p.p. less potatoes (Borowski et al 2016).

Among those who waste food, there are people with higher education (26%), those surveyed, who assess well the material situation of their households (30%), managers and specialists (35%), people with primary education (12%), pensioners (12%), as well as respondents aged 60 and over (12%) (Borowski et al. 2016).

TNS Polska research shows that food wastage is more often associated with wealthier people who can afford to buy larger amounts of food that is not fully justified, and those who, due to their position, spend more time away from home, as well as to a lesser extent control the content of their refrigerators. Less frequently, food is wasted in the homes of people who cannot afford such wastage (TNS Polska 2012).

Food waste generates more expenditure on food and non-alcoholic beverages. The total expenditure in households in Poland in 2014 amounted to PLN 1078.74 per month per person, including PLN 263.34 for food products and non-alcoholic beverages, which accounted for 24.4% of the total expenditure. Definitely the lowest level of total expenditure should be characteristic of farmers' households - PLN 799.35 per capita, and the largest households of selfemployed persons - PLN 1302.40 per capita (Borowski et al 2016).

Food waste is responsible for 7% of the world's greenhouse gas emissions, i.e. 3.3 billion tonnes of CO2 equivalent per year. Reducing food waste is one of the measures to reduce greenhouse gas emissions that affect climate change. The Waste and Resources Action Programme (WRAP) estimates that by 2030 global greenhouse gas emissions could be reduced to around 0.2 billion tonnes of CO2 equivalent per year by reducing global food waste (WRAP 2015).

Conclusion

The main problem of food wastage is the difficulty in counteracting it, resulting, among other things, from the very diverse causes of this phenomenon and economic, social and political conflicts. The richer countries waste more food, which is due to economic reasons (the inhabitants of such countries earn more and buy more food, which they unfortunately waste). People in poorer countries do not have the opportunity to buy a large quantity of food, or they do not have the opportunity to produce the food that would satisfy their needs, so they waste much less food. An important step towards combating food waste and minimising food waste is to take various measures to raise consumer awareness. They should buy the amount of food they need to consume and not buy food for the so-called supply. At present, there is much talk of wasting food, but unfortunately little is being done to reduce food waste. In every country in the world steps should be taken, actions should be taken regarding food wastage. Giving excess food from our farm to poor and needy people minimises the problem of food wastage.

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FOOD WASTE IN THE WORLD AND IN POLAND

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According to the United Nations, 1.3 billion tonnes of food, one third of which would be edible, is being wasted worldwide. In Europe alone, around 89 million tonnes of food are being wasted. 178 kg of food is thrown out per inhabitant of the European Union every year. In Poland annually, according to reports of the Federation of Polish Food Banks, they waste about 235 kg of food per capita, which places Poland in 5th place in relation to food throwing away in Europe. Throughout the country, Poles waste 9 million tons of food. Food wastage is not only referred to as a phenomenal aspect, but also as an economic, social and energy aspect, as well as influencing the environmental aspect. At every stage of the food chain there is a responsibility for food waste, which is why it is necessary to take action to limit these losses.

The main problem of food wastage is the difficulty in counteracting it, resulting, among other things, from the very diverse causes of this phenomenon and economic, social and political conflicts. The richer countries waste more food, which is due to economic reasons (the inhabitants of such countries earn more and buy more food, which they unfortunately waste). People in poorer countries do not have the opportunity to buy a large quantity of food, or they do not have the opportunity to produce the food that would satisfy their needs, so they waste much less food. An important step towards combating food waste and minimising food waste is to take various measures to raise consumer awareness. They should buy the amount of food they need to consume and not buy food for the so-called supply. At present, there is much talk of wasting food, but unfortunately little is being done to reduce food waste. In every country in the world steps should be taken, actions should be taken regarding food wastage. Giving excess food from our farm to poor and needy people minimises the problem of food wastage.

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