Agricultural production, sustainable food system and food (non)waste

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Summary

Agriculture is the most important branch of the economy. It is influenced by natural processes, but also by human intervention in nature, especially rapid urbanization. Another factor is globalization, population growth and pressure on the growth of food supply chains. The production of an ever-increasing amount of food to satisfy the basic needs of 8 billion inhabitants had and still has an impact on the intensification of agricultural production. Increased food production has not avoided an increase in the use of pesticides which has had an impact on soil resources, soil biodiversity and in an unplanned way on our diet. The increase in production also ensured better affordability of food. Intensive agriculture exerts significant pressure on the landscape and soil for example in the form of contamination, erosion and compaction caused by heavy agricultural machinery. It accounts for up to six percent of CO_2 emissions in the entire Union. Experts draw attention to the fact that the area of land that is used worldwide to grow unnecessary food is greater than the area of India and Canada. It is necessary to seriously deal with the way crops are grown, their subsequent processing and distribution. There are several opinions on how to deal with this problem. Disruption of supply chains and restriction of transport significantly contributed to the immediate need to change some methods of production and distribution of crops and food. A particularly important topic is the relationship to the soil, food quality, food habits and waste production. Food waste is an ecological and climate product. In the European Union, almost 57 million tons of food is wasted annually, which is 127 kilograms per person. In Slovakia around 860,000 tons of food is thrown away per year, which is approximately 163 kilograms per inhabitant. The European Union is also trying to reduce the volume of food waste by fulfilling goals of the strategy "Farm-to-Fork". The European Commission is revising the waste directive to reduce food waste. In the contribution on the one hand, we focused on agriculture and its impact on the environment and its role in meeting the demand for food, and on the other hand we conducted a survey through a questionnaire. Based on our survey we can conclude that more than half of the respondents are concerned with the impact of the food they buy on the environment, some plan to limit the consumption of meat and meat products, which is a prerequisite for possible changes in consumer behaviour in relation to the environment, primarily to minimize waste with food.

Keywords: *affordability of food, the environmental footprint, food safety, food waste.*

Introduction

Agriculture together with forestry, aquaculture, food and chemical industry is part of the bioeconomy. The bioeconomy is a part of the economy that uses renewable biological resources to produce food, feed, chemicals, textiles and energy in a sustainable way. The concept of a sustainable bioeconomy is gaining traction on the international political agenda with governments around the world adopting bioeconomy strategies. The main goal of agricultural production in the context of the bioeconomy is to ensure a sufficient amount of high-quality and healthy food in a sustainable way, which is part of the circular economy.

Food is one of the essential goods that satisfy the basic needs of the population. Healthy and high-quality food is a requirement for most consumers. The food system is affected by globalization, which on the one hand affects economic growth, but also poverty and environmental degradation. The agri-food

industry is complex, requires a wide range of processes and operations, but is largely inefficient. It faces challenges to increase productivity, it needs solutions for growers, producers, traders[1].

In agriculture predicted climate changes will affect crop yields and their geographical distribution, as well as livestock breeding[2]. Due to the increasing intensity of extreme weather fluctuations the risk of crop failure will increase (Bernard, et. al.).[3] The consequences of climate change will also affect the soil - the amount of organic matter in it will decrease, which is a decisive factor in its fertility (Blanc, Liang et. al.)[4,5]. Food production is increasing significantly to meet the needs of the population in countries where the income of the population is increasing. Food supply chains are coming under great pressure as a result of the conflict in Ukraine. However, future developments would encounter disruptions to global supply chains. Transport is responsible for almost 5% of the total emissions of the food system, so shortening supply chains seems desirable, especially in relation to fruit and vegetables, where refrigerated transport contributes significantly to the carbon footprint (Crippa, et. al.)[6]. However, it is also important to distinguish between shorter food supply chains and more sustainable food supply chains, as they are not necessarily the same. For example, it might be technically possible to produce soybeans in Norway for the Norwegian market using a lot of energy, but the total carbon footprint would be higher than growing soybeans in Brazil or the US, where the energy required is much lower (and more than offsets the impact of transporting soybeans to Norway). Many soft commodities can be produced economically and in sufficient quantities in only a few countries, and replacing these products with alternatives is often difficult. Figure 1 illustrates the extent of this concentration for corn, rice, soybeans and wheat, where the five largest producing countries account for between 58% and 85% of world exports of these commodities.

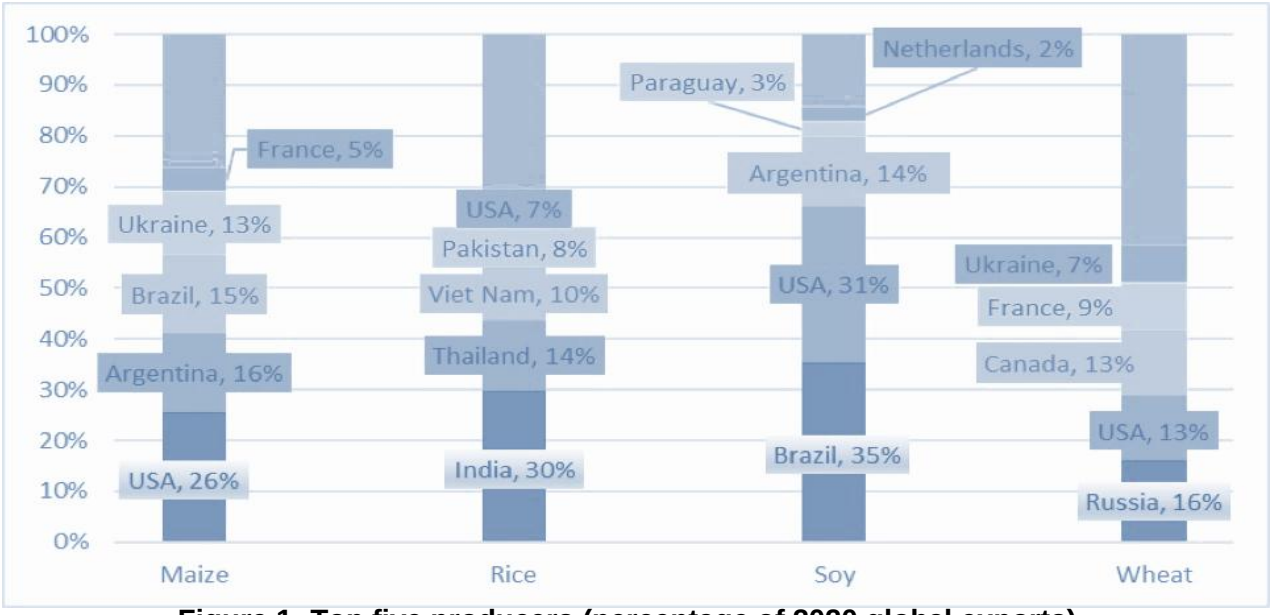

Figure 1: Top five producers (percentage of 2020 global exports).
Source: Food and Agriculture Organization of the United Nations **(**FAO)[7]

A May 2020 survey of 70 respondents by McKinsey found that 93% plan to make their supply chains "more flexible, agile and resilient". A follow-up survey 12 months later found that 92% of respondents had changed the physical footprint of their supply chains and nearly 90% expected to continue some degree of regionalization over the next three years[8]. In addition to increased resilience shorter supply chains are easier to monitor allowing companies more control over sustainability risks such as slave labour, greenhouse gas emissions and biodiversity loss as well as more traditional business risks such as fraud. At the same time the possibility of satisfying the demand for food is limited as the area of land for production is limited the number of inhabitants is increasing. The trend of satisfying needs will have to change both in production and consumption. Continued expansion and intensification will affect resources which will affect the food system. The preservation of ecosystems and the future well-being of

the human population are centrally dependent on the structural transformation of the food system towards a sustainable and resilient state[9].

Reducing the environmental footprint of agriculture and food systems and improving the environment and ensuring healthy and affordable food are to be achieved in the countries of the European Union through the "Farm-to-Fork" strategy[10]. The creation of a favourable "food environment" that facilitates the choice of healthy and sustainable eating can have a positive effect on the health, quality of life of consumers, reduce social costs related to health, production and consumption of food[11]. The EU food system is supposed to ensure fresh and safe food for all Europeans. Food safety is measured through three basic dimensions, affordability, physical availability, safety and nutritional value of food. The basis of food security is the soil as it provides 95% of the food we consume. The EU's 2030 Soil Strategy adopted on 17 November 2021 sets out a vision for all soil to be in a healthy state by 2050 and for soil conservation, sustainable use and restoration to become the basic norm[12]. Soil contains more than 25% of the world's biodiversity is the largest terrestrial carbon store on the planet, and plays a key role in the circular economy and adaptation to climate change. However, around 60-70% of EU soil ecosystems are unhealthy and suffering from degradation. It is estimated that land degradation costs the EU approximately 50 billion € per year. Halting and reversing current land degradation trends could bring up to €1.2 trillion annually in economic benefits. However, sustainable land management and its restoration requires the involvement of a wide range of economic and social entities.

Agriculture production and sustainable food system

Global food and agricultural production have increased significantly since the end of World War II due to a combination of population and economic growth along with technological and cultural shifts in production practices. Rapid human population growth coupled with unsustainable patterns of consumption and production has contributed to various forms of environmental degradation including global warming, climate change, deforestation and biodiversity loss. Global wildlife populations fell by two-thirds between 1970 and 2020, while the human population more than doubled. Since 1990, an estimated 420 million hectares of forest have been lost to land conversion, and the area of primary forest has decreased by more than 80 million hectares worldwide. Environmental damage often results from economic processes that lead to a higher standard of living, especially when market prices do not include the full social and environmental costs, such as damage caused by pollution and habitat destruction[7].

The Green Revolution played a significant role in the introduction of intensive agricultural production methods throughout the world and the formation of governing philosophies in common agricultural practice. Global yields have increased steadily since the 1950s so more food is now produced per person than ever before. Although widely acknowledged to have helped avert the expected widespread food shortages of the post-World War II era, the intensification practices brought about by the Green Revolution have also been criticized for causing ecological degradation, unsustainable resource consumption and entrenching dependence on non-renewable resources such as fossil fuels. Intensification, consolidation and specialization are some of the broad behavioural trends inherent in the food system. The system as a whole is dominated by intensive practices, and a small number of actors in production, processing and retail control the majority of the food system and strongly influence policy-making. Stronger states widely abuse loopholes in trade agreements leading to unfair economic competition for developing countries ultimately producing dependency and undermining local food security[10].

Based on Planet Tracker's analysis the assets of 400,000 companies connected to the food system were estimated and the revenues they would produce related to food system activities (estimated revenues in the range of 15 to 19 trillion USD - about 20% of global GDP). Lowder et al.[13] estimate that there are around 510 million smallholder farmers.

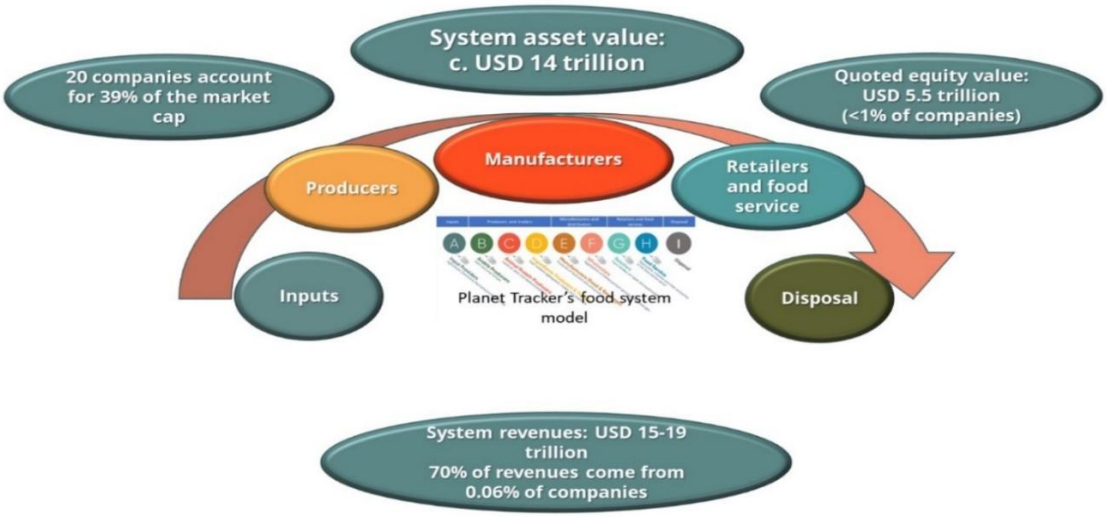

Figure 2: The value of the global food system

Source: Planet Tracker[14].

A sustainable food system is essential to achieving climate and environmental goals[15, 16]. It can help protect Europe's nature and biodiversity as the Farm-to-Fork strategy is also aligned with the EU Biodiversity Strategy until 2030, as biodiversity is of fundamental importance for food security and people's well-being[10]. The goal is to protect nature, reverse the degradation of ecosystems and reduce emissions in all areas. This also applies to agricultural production. In every activity related to food production greenhouse gases are released into the atmosphere. Agricultural activities primarily release a large amount of two very effective greenhouse gases – methane and nitrous oxide (Smatana, - Macák)[17]. In Slovakia agriculture accounts for a smaller share of emissions than in the EU. While in Slovakia the sector is responsible for 7% of total emissions in the Union it is 11%.

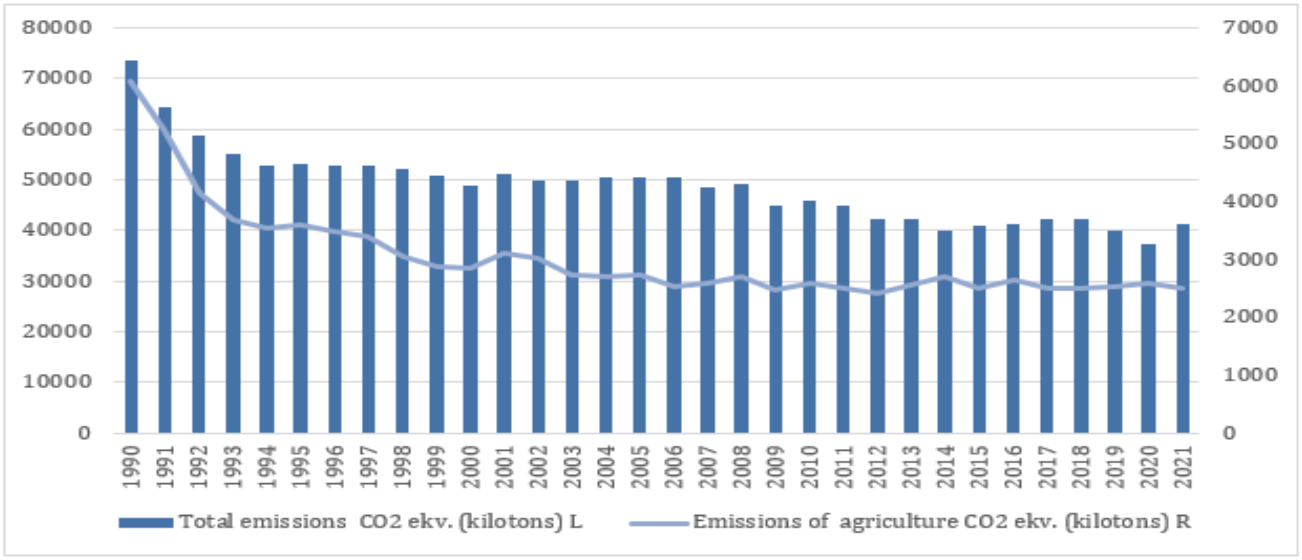

Figure 3: Total emissions and emissions from agriculture in the Slovak Republic

Source: own processing

Greenhouse gas emissions in Slovak agriculture have fallen by 59% since 1990. The main reason is, above all, the decrease in livestock numbers. They have been at a stable level since 2005. Greenhouse gas emissions from agriculture are to be reduced by 10% by 2030. This is the goal prescribed for the agricultural sector in Slovakia by the Ministry of the Environment in the draft climate law.

European Commission wants to reduce meat consumption in the "Farm-to-Fork" strategy. According to it, the food system of the Union will be sustainable in the long term only if the consumption of meat is reduced. Workers from the National Agricultural and Food Centre and the Slovak Hydrometeorological Institute investigated the entire carbon balance of cow breeding, including the cultivation of fodder, during which carbon from the atmosphere enters the soil through photosynthesis. The result of their calculations is that after taking into account the carbon stored the carbon production of the average cow is even negative. The carbon footprint of a cow with a live weight of 602 kg and a milk yield of 10,400 l is 8,832.65 kg CO2eq. per year, on the other hand, the plants that must be grown for such a cow consume 9,289.34 kg of carbon dioxide during photosynthesis. This means that the plants needed for the cow's nutrition consume 465 kg of CO_2 more from the air than the CO2eq production of this cow per year. From the above it follows that the balance of the carbon cycle is preserved when raising cows, and it is not entirely correct to claim that cows are a contributor to global warming[18].

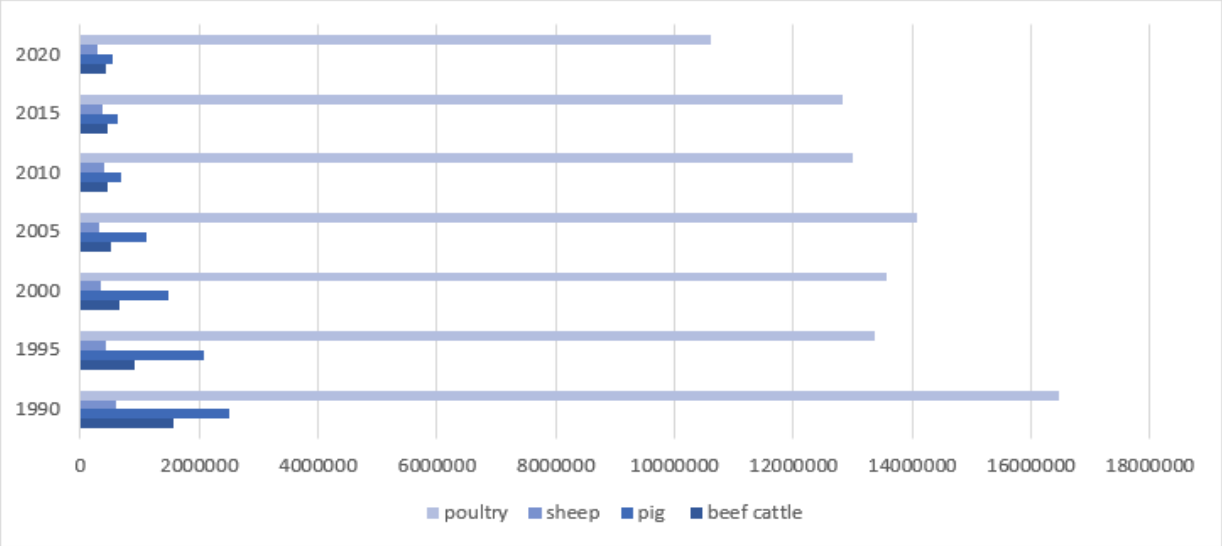

Figure 4: Development of aggregated animal numbers in the Slovak Republic
Source: own processing [19]

Meat consumption can also be gradually reduced thanks to "new foods". New foods and their consumption are in line with the aforementioned "Farm-to-Fork" strategy. The strategy recommends research into alternative proteins, including insect proteins and meat alternatives, to help the food sector mitigate and adapt to climate change, preserve biodiversity and secure food in a healthy and fair way. It has framework programs to achieve the goals of the European Green Deal including the "Farm-to-Fork" strategy[20]. One was Horizon 2020, which had 1 billion € available for cellular meat research in the European Union. In the period 2021-2027 this research is financed by the Horizon Europe program within the mission area "Healthy food and a healthy environment". From Horizon Europe around €9 billion has been allocated to support research and innovation in the areas of "food, bioeconomy, natural resources, agriculture and the environment", with one third of this budget allocated specifically to agriculture. €2 billion is already planned for various challenges in the years 2023-2024. Additional funds are also earmarked for research projects developing pilot vaccines against African swine fever, which has significantly affected the sector. The Commission also generally supports cross-sectoral cooperation and the involvement of farmers, advisors and other actors in research projects, in particular through the Agricultural Knowledge and Innovation System (AKIS).

Paradoxically the European Commission in the strategy "Farm-to-Fork" talks about the need to reduce meat consumption in the EU. Between 2016 and 2020, however, it paid out almost €220 million to promote the consumption of meat and dairy products[21].

Global food production and food waste

Due to increases in population wealth and urbanization, the world has seen an overall increase in food demand coupled with a shift in dietary preferences towards more resource-intensive foods. Although a sufficient amount of food is already being produced, by 2050 food production will need to be increased by more than 60%. As businesses strive to produce agricultural crops and food for sustenance, the big problem is that according to the Food Waste Index Report 2021, one-third of food is wasted worldwide, which is more than 931 million tons of food costing the global economy nearly €900 billion. Of this, around 30% of all cereals, 20% of dairy products, 45% of vegetables and fruits, 20% of oil seeds and legumes, 35% of fish and seafood, 45% of root vegetables and tubers and 20% of meat are thrown away. Food waste is generated at every stage of the production and supply chain, from initial agricultural production to final consumption in households. It is estimated that approximately 14% is lost between harvest and the retail market, and 17% of food is wasted at the retail and consumer level (UNEP, 2021)[22]. Food waste has far-reaching effects both nationally and globally. In the US, up to 40% of all food produced is not eaten and about 95% of wasted food ends up in landfills. It is the largest component of municipal solid waste with 21%. The food we don't eat produces up to 10% of global carbon emissions at retail and in homes. according to the UN, if food loss and food waste were a separate country, it would be the third largest producer of greenhouse gases in the world after the US and China. When we waste food, we also waste the resources needed to produce it, such as land, water and energy[22,23]. Wasting food is morally wrong also because the amount that is currently wasted would be enough to feed twice the number of malnourished people in the world.

The main causes of waste include overproduction, harvest losses, poor crop storage, improper transportation, packaging errors, high aesthetic standards for fruits and vegetables, buying too much stock, disproportionately large portions in catering establishments, poor consumer habits, improper storage food by households. Food waste is also a direct financial loss for producers, traders and consumers. In the total bill for the production of food that is never eaten, the costs associated with land acquisition and erosion, loss of biodiversity, air pollution, water degradation, loss of dwellings, health damage and compensation for these losses must also be added. In developing countries food is wasted at harvest time. Poor storage facilities on farms lead to pest and mould infestations that destroy crops. Lack of access to technology and markets means that many farmers are forced to watch their crops rot in the fields, as the labour and financial investment needed to harvest them is often unavailable. In rich countries the purchase itself is basically the beginning of food waste. According to van Geffen et al., 2020[24], food waste is related to the neglect of shopping planning, the place of purchase, the way food is stored and the way food is prepared for consumption. Because households do not plan what meals they will prepare, they buy uncontrollably, when they also buy food that they do not need to consume. Uncontrolled quantities are also purchased due to sales promotions in stores. Some consumers are not aware of expiration dates, store food inappropriately or to try new foods and try foods they do not know and experiment with them. New untried foods may not be tasty and become waste. Food waste occurs during food preparation in the kitchen, when a large amount of food is prepared that is not consumed and perishes in refrigerators or kitchen cabinets.

In the countries of the European Union about 20% of produced food goes to waste, but about 33 million people cannot afford quality food, and food aid is a necessity for part of the population. According to the portal Free - food, in the countries of the European Union, primary production is responsible for approximately 11% of food waste, production and processing 19%, distribution 5%, restaurants 12% and consumers up to 53%, which is about 70 kilograms per inhabitant[25,26]. Part of the food waste is a consequence of legislation that is often introduced to protect human health. An example is the way some meat and dairy products are handled. All such products had to be disposed of at the end of the sales period.

Results and discussions

Already in 2011 the European Commission in its plan to create a Europe that uses resources efficiently pointed out the fact that waste is produced in the food industry. The fact that people produce significant amounts of food but do not eat it has major negative impacts: environmental, social and economic. Estimates suggest that 8-10% of global greenhouse gas emissions are related to food that is not consumed. Reducing food waste at the retail, food service and household levels can provide multi-faceted benefits for people and the planet. However, the true extent of food waste and its impacts have not yet been well understood. The opportunities offered by reducing food waste have remained largely unexploited and underutilized. If we want to get serious about fighting food waste, we need to increase efforts to measure food waste and inedible parts at the retail and consumer levels, and track the production of food waste in kilograms per capita at the country level. Only with reliable data will we be able to track progress towards Sustainable Development Goal (SDG) 12.3, which aims to halve global food waste per capita at the retail and consumer levels and reduce food losses in production and supply chains, including post-harvest losses.

Based on Eurostat data, the most food waste occurs in Cyprus (397 kg/person). In Denmark food waste is 221 kg per inhabitant, in Greece 191 kg per inhabitant, in Portugal 184 kg per inhabitant. The least amount of food waste per inhabitant is in Slovenia (68 kg) and Croatia (71 kg). In Slovakia, there is 83 kg of food waste per inhabitant. Of this households produced up to 78%, i.e. 65 kg per inhabitant, of which 22% (18 kg/inhabitant) was food waste generated in primary production (16%), in the food industry (1%), in retail or distribution (4%) and in catering facilities (1%)[27].

The (im)possibility of changing behaviour in food handling in the Slovak Republic

As we have already stated, in Slovakia, as well as in other countries, food waste is mainly generated in households. For the purposes of our article we conducted a survey with the aim of finding out the attitude of Slovak consumers towards food, how they shop, whether they keep in mind the environmental impact of the food they buy on the environment, what kind of food they buy and consume. The research question was whether the respondents take into account the impact of the food purchase on the environment when purchasing food. We established research questions. Q1: Does the quality of food influence at least half of the respondents when buying? Q2: When choosing food, do the respondents also monitor the impact on the environment? Q3: Do the respondents buy food of Slovak origin?

We conducted the survey through an anonymous questionnaire. Respondents filled out the questionnaire from February 12, 2023 to February 28, 2023. 250 respondents were contacted, 235 questionnaires were returned. The success rate of the survey was 94%. Out of the total number 72% (169) women and 28% (66) men took part in the questionnaire survey of which 28.4% (67) respondents were in the age range of 20-25 years, and 23.4% (55) respondents in the age range of 26-34 years, in the age range of 35-49 years 24.7% (58) of respondents, in the age range of 50-59 years 17% (40) of respondents and in the age range of 60 and over 6.5% (15) of respondents. The educational structure was diverse, the most respondents were 43.6% (102) with secondary education, 41.2% (97) with university education and 15.2% (36) with basic education. Based on the regional analysis, the majority of respondents participated in the survey from the region of Košice (17.9%), Trenčín (15.7%), Bratislava (14.8%), Banská Bystrica (12.5%). (Figure 5).

Part of the survey included qualitative and quantitative questions related to respondents' shopping habits, monthly food costs, and questions about how respondents deal with food that they do not consume. The respondents' answers to the question: "How often do you buy foods?" showed that 38.5% buy foods three times a week, twice a week 28.3% of respondents, once 16.5% of respondents and once every 2 weeks 16.7% of respondents. When asked whether respondents consider the quality of food when purchasing, for 69.5% of respondents the quality of food is important, for 29.4% of respondents due to their income, the quality of food only occasionally influences their purchase and 1.1% of respondents do not consider the quality of food when purchasing. Based on the answers, we can conclude that more than half of the respondents consider the quality of food when buying food (Q1).

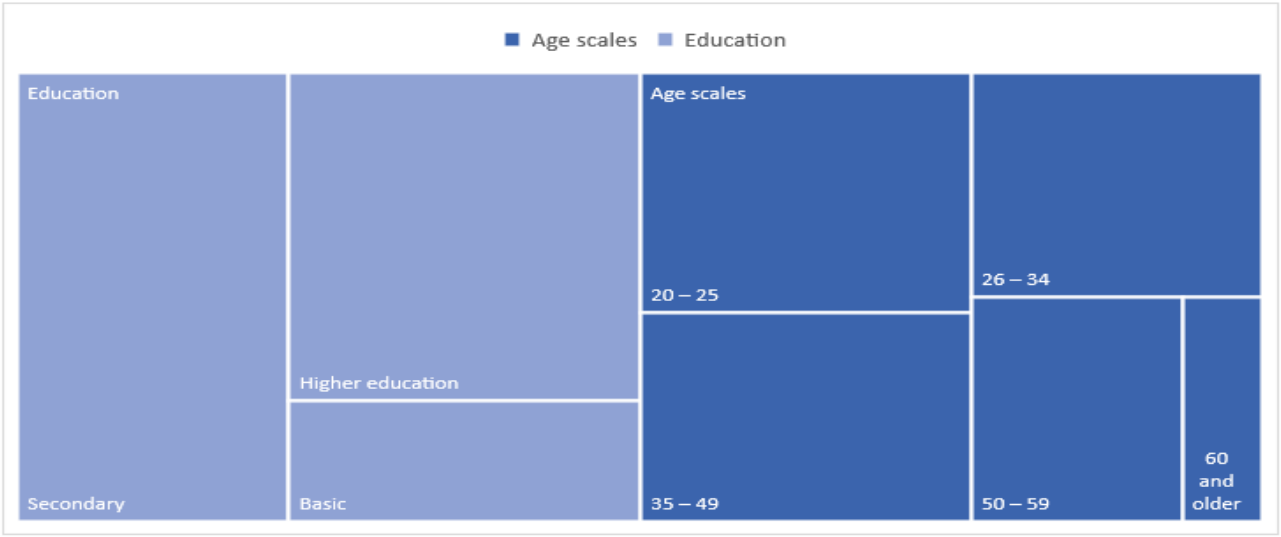

Figure 5: Socio-economic characteristics of respondents (%)

Source: own processing

To the question "What is the average monthly expenditure on food?" of the total number of respondents 2.6% answered that they spend €350 or more on food, 14.6% answered that they spend €300 to €349 or more on food per month, 46.8% of respondents have monthly food costs in the range from €250 to €299, 25.6% of respondents have monthly food costs in the range from €200 to €249 and 10.4% up to €199. By further analysing the answers of the respondents we found that the country of origin also influences the respondents when buying food. Out of the total number up to 79.6% of respondents follow the country of origin, the others do not focus on this fact. As for the preference to buy Slovak food we found out from the answers that 96.4% of the respondents buy Slovak food and we got a positive answer to the research question Q3 and the respondents buy food of Slovak origin. Through the following analysis of the answers, we get a positive answer to the research question Q2: Do the respondents also monitor the impact on the environment when choosing food? 53.6% of respondents said that when buying food, they are interested in whether the food has an impact on the environment, 26.7% of respondents only sometimes think about the impact of the purchased food on the environment and 19.7% of respondents are not interested in the impact of food on the environment.

On the basis of the obtained data on the frequency of food shopping, we looked in more detail at the frequency of food shopping by the group of women and the group of men. We formulated the null hypothesis H0: There is no statistically significant association between gender and frequency of food shopping. At the same time, we formulated an alternative hypothesis H1: There is a statistically significant connection between gender and the frequency of food shopping. Based on the contingency table for observed (O) and expected (E) abundances, we tested the hypotheses at the alpha 0.05 significance level. Since the table value of Chi-square was smaller (7.81) than the calculated value, we reject the hypothesis H0 and accept H1. We can state that in our research sample there is a relationship with a moderately strong dependence (0.38) between the variables gender and shopping frequency.

We also addressed the consumption of meat in the previous parts of the post, we asked the respondents how often they consume meat. The question is related to the possibilities of changing the eating habits of consumers, as the goal is to reduce the consumption of animal products and replace them with a plant-based diet. We asked respondents how often they consume meat. The answers showed that 2.9% of respondents consume meat more than five times a week, 13.5% of respondents consume meat three times a week, 48.7% of respondents consume meat twice or less, and 34.9% of respondents do not consume meat. Respondents had the opportunity to state the reasons for consuming meat. As for the reasons why they consume meat they stated that a plant-based diet is not very nutritious for them, they have domestic livestock, they are used to consuming meat and meat products, and they cannot imagine another way of providing protein. To the question: "Are the respondents

interested in the quality of life of the animals from which the meat comes?" up to 91.2% of the respondents are interested in the methods of animal husbandry. Respondents who consume meat had the opportunity to answer the question Do you plan to reduce or completely limit the consumption of meat and meat products? 48.9% of respondents definitely want to reduce the consumption of meat and meat products, 25.6% want to limit the consumption of meat and meat products, and 32.4% of respondents do not plan to reduce or limit the consumption of meat and meat products.

Table 1: Respondents' shopping frequency, attitude towards food quality and the environment

I buy food	**Frequency**	**Cumulative frequency**	**Relative frequency (%)**	**Cumulative relative frequency (%)**
once/week	39	39	16.5	16.5
twice/week	66	105	28.3	4.,8
three times/week	90	195	38.5	83.3
once/2 weeks	40	235	16.7	100.0
I take the quality of food into account when buying	**Frequency**	**Cumulative frequency**	**Relative frequency (%)**	**Cumulative relative frequency (%)**
I take into account the quality of food rather	163	163	69.5	69.5
I do not take into account due to income	69	232	29.4	98.9
I do not consider the quality of food	3	235	1.1	100.0
Impact on the environment	**Frequency**	**Cumulative frequency**	**Relative frequency (%)**	**Cumulative relative frequency (%)**
I'm interested in	126	126	53.6	53.6
rather yes	63	189	26.7	80.3
not	46	235	19.7	100.0

Figure 6: Change in consumer behaviour in relation to the consumption of meat and meat products (%)

Source: own processing

We also asked respondents whether they produce food waste. Up to 91.5% of respondents answered positively. At the same time, they had the opportunity to state why they do not consume the foods they buy and which are the most common. Respondents stated that a large part of unconsumed food is bread and bakery products, vegetables and fruits, as they are perishable. They also gave a reason, which is the fact that they buy more than they consume at stock prices. In this context, we asked how the respondents deal with food that they do not consume. Respondents who live in cities said that they use containers for food waste (89.8%), the rest place food waste in municipal waste containers. Respondents living in rural areas put food waste in composters and use it for raising pets.

Based on the conducted survey, in its conclusion, we can state that most respondents look at their quality when buying food and are also interested in their impact on the environment. It is a potential for supporting the consumption of products of domestic and regional production with a subsequent positive effect for other sectors of the Slovak economy. As for changing eating habits, the majority of respondents want to limit the consumption of meat and meat products, but there are also those who do not plan to do so. An important finding is the fact that we waste food even though Slovak households spend 20.5% of their income on food, which is one of the highest shares among EU countries. In order to reduce food waste it is necessary to start from the consumer's side. Purchasing management can be the first step. Shopping planning is a way for consumers to avoid buying excessive amounts of food. Another possibility is to correctly estimate the amount of food to be prepared for direct consumption at home and to learn how to properly store food. Although these are small steps, they will help to reduce food waste and reduce CO_2 production on a global scale. Since food waste is the fifth largest producer of emissions in the EU, the European Commission has proposed a revision of the waste directive, which includes a binding target for reducing food waste. The states of the European Union will be obliged by law to reduce the total food waste in shops, restaurants and households by 30 percent per inhabitant by the end of 2030. The starting year for the measurement will be 2020. In order to fulfill it, the average Slovak household would have to reduce its annual food production within seven years waste by 20 kilograms.

Conclusion

In the article, we tried to point out the effects of economic development, which were accompanied by undesirable effects in the form of a degraded environment. We focused on agriculture as a sector that, together with other sectors of the food industry, transport, trade, ensures livelihood for the inhabitants. Recently, in connection with the increase in the number of the population and the need to feed the population, increased attention has been paid to the processes of loading and using food, food losses and food waste. Food waste presents several specific challenges and opportunities for people to prevent the continuous deterioration of the environment and improve people's health, as food that is not consumed or otherwise used ends up as waste. Food losses and food waste produce a relatively high volume of greenhouse gases created by humans, which have a negative effect on living conditions on Earth. It is estimated that the amount of emissions caused by food loss and waste is increasing. It can contribute to their elimination by applying sustainable agricultural productivity and minimizing its impact on biodiversity, soil, food losses and their waste. This is possible, for example, by shifting to a healthier diet through a sustainable food system[28,29,30]. A sustainable food system is a type of food system whose goal is to provide healthy food for people and create a sustainable environmental and economic environment, primarily on regional level. Reducing food loss and waste is a significant lever for wider improvements in our food systems towards improving food safety, quality and sustainability and increasing farm efficiency.

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Poľnohospodárska výroba, udržateľný potravinový systém a (ne)plytvanie potravinami

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Súhrn

Poľnohospodárstvo je najdôležitejšie odvetvie ekonomiky. Je ovplyvňované prírodnými procesmi, no aj zásahmi človeka do prírody najmä rapídnou urbanizáciou. Iným faktorom je globalizácia, nárast počtu obyvateľov a tlak na rast potravinových dodávateľských reťazcov. Produkcia stále väčšieho množstva potravín pre uspokojenie základnej potreby 8 mld. obyvateľov, malo a má stále vplyv na zintenzívňovanie poľnohospodárskej produkcie. Zvýšená produkcia potravín sa nevyhla nárastu používania pesticídov, čo malo vplyv na pôdne zdroje, pôdnu biodiverzitu a neplánovaným spôsobom aj na našu stravu. Nárast produkcie zároveň zabezpečil lepšiu cenovú dostupnosť potravín. Intenzívne poľnohospodárstvo vyvíja na krajinu a pôdu výrazný tlak napríklad v podobe kontaminácie, erózie a zhutňovania zapríčineného ťažkými poľnohospodárskymi strojmi. V celej Únii tvorí až šesť percent emisií CO_2. Odborníci upozorňujú na fakt, že rozloha pôdy, ktorá sa využíva na celom svete na pestovanie zbytočných potravín je väčšia ako rozloha Indie a Kanady. Je nevyhnutné vážne sa zaoberať spôsobom pestovania plodín, ich následným so spracovaním a distribúciou. Existuje viacero názorov na to, ako sa s týmto problémom vysporiadať. Narušenie dodávateľských reťazcov obmedzenie dopravy, výrazne prispelo k okamžitej potrebe zmeniť niektoré spôsoby výroby, distribúciu plodín a potravín. Zvlášť dôležitou témou je vzťah k pôde, kvalita potravín, potravinové návyky ako aj produkcia odpadu. Potravinový odpad je ekologickým, ale aj klimatickým výrobkom. V Európskej Únii sa ročne vyhodí takmer 57 miliónov ton potravín, čo predstavuje 127 kilogramov na osobu. Na Slovensku sa za rok vyhodí okolo 860 tisíc ton potravín, čo je približne 163 kilogramov na obyvateľa. Európska únia sa snaží znížiť objem potravinového odpadu aj plnením cieľov stratégie Z farmy na stôl. Európska komisia reviduje odpadovú smernicu na zníženie potravinového odpadu. V príspevku sme sa na jednej strane sústredili na poľnohospodárstvo a jeho vplyv na životné prostredie, jeho úlohu v uspokojovaní dopytu po potravinách a na druhej strane sme realizovali prieskum prostredníctvom dotazníka. Práve na základe nášho prieskumu môžeme konštatovať, že viac ako polovica respondentov sa zaoberá vplyvom kupovaných potravín pôvodom na životné prostredie, niektorí plánujú obmedziť konzumáciu masa a mäsových výrobkov. Problémom je skutočnosť, že až 91,5 % opýtaných respondentov produkuje potravinový odpad. Veľkú časť neskonzumovaných potravín (predovšetkým chlieb a pekárenské výrobky, zelenina a ovocie) nakupujú za akciové ceny, kedy nakúpia viac ako spotrebujú. Predpokladom možných zmien vo vzťahu k životnému prostrediu a plytvaniu s potravinami je zmena v spotrebiteľskom správaní a predovšetkým správne nastavenie manažmentu nakupovania potravín. Zníženie strát potravín a odpadu je významnou pákou pre širšie zlepšenia v našich potravinových systémoch smerom k zlepšeniu potravinovej bezpečnosti, kvality a udržateľnosti a zvyšovaniu efektivity fariem.

***Kľúčové slová**: Cenová dostupnosť potravín, environmentálna stopa, bezpečnosť potravín, plytvanie potravinami,*