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Sustainability of Food Quality in Connection with the Quality of Life and the Environment

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Abstract

Quality of life is one of the most important and extremely discussed concepts in Europe today. It is used primarily as a target value for the economic development of society, but it has also become a new challenge to ensure a dignified life for EU citizens. Last but not least, the quality of life is also mentioned in connection with the promotion of the concept of sustainable development and sustainable consumption. The content of our contribution will point out hazardous substances that can have an impact on the food chain.

Keywords: *quality of life, sustainable, food chain, environment, nutrition*

JEL Classification: *Q01, Q51, Q56*

1. Introduction

The terms sustainability and sustainable development began to be used in the early 1970s, especially in the context of the recognition that any uncontrollable growth (population, production, consumption, pollution, etc.) is unsustainable in resource-constrained environment. Sustainable development in the Slovak Republic is legally defined by § 6 of Act no. 17/1992 Coll. on the environment. According to him, this is a development that preserves the ability of current and future generations to meet their basic living needs and at the same time does not reduce the diversity of nature and preserves the natural functions of ecosystems (National Strategy for Sustainable Development of the Slovak Republic, 2001).

In the EU, the Hazard Analysis and Critical Control Point (Regulation (EC) 852/2004 on the hygiene of foodstuffs, 2004) was enacted in 1997 as a tool to identify risks related to the production, storage, distribution and preparation of food, including beverages and condiments. It became mandatory in Slovakia from 1.1. 2020 and is modified VIII. head of the Food Codex. It must be said that most quality systems are focused on quality control. The motto of the HACCP system is that it is based on prevention. Its importance is declared by non-destructive continuous inspection of materials, conditions, processes and their parameters, instead of extensive laboratory inspection of products. HACCP is applied throughout the food chain from primary production to final consumption. This means that food safety should be a joint effort of all organizations in the food chain, from feed manufacturers, primary producers, transport and storage operators to subcontractors, retail establishments and catering establishments. Other partners must be involved in the quality system, such as suppliers of packaging materials, cleaning agents, additives and other ingredients needed in food production. Non-profit organizations are also expected to be responsible for food safety.

However, less attention is paid to the impact of the environment and its possible contamination as a source of poor quality raw materials. However, many companies are increasingly using as a

marketing distinction from the competitive environment and demonstrating the whole system of transformation of inputs to outputs. So, we can notice e.g. on chocolate packaging that companies accurately identify all the circumstances and inputs to the value chain of the final product. However, this fact is rather exceptional in our country and applies to the so-called Luxury products imported from abroad, or traditional foods, where it is easier to identify their origin.

This is the reason why we have focused on substances that can have a very significant impact on the quality of the final product and are not directly related to any circumstance concerning the transformation process as such, but are directly related to the inputs to it.

1.1 Food chain

Food has been a staple source of human nutrition for centuries, as it supplies energy and essential nutrients (proteins, carbohydrates, minerals, fats). Due to the presence of contaminants that enter food from exogenous environments during processing, it is necessary to systematically address their composition.

The food chain is a complex chain of relationships between food producers, producers, retailers and consumers. It is influenced by all stakeholders through their activities and may pose a potential risk to the final consumer. Food can be exposed at several stages of the chain to toxic amounts of various chemicals that enter them through agricultural practices, industrial processing, inappropriate storage or environmental contamination (European Court of Auditors, 2019).

Therefore, the issue of limiting the penetration of foreign substances into the food chain is not only a matter for the Ministry of Agriculture and Nutrition, but the implementation of this task is unthinkable without the clear co-responsibility of other ministries.

Foods themselves consist of chemicals, but those that have the potential to cause adverse health effects are considered dangerous. About 75% of new diseases that have affected humans since 2000 come from animals or products of animal origin (European Food Safety Authority, 2013)

Food safety is a top priority in the EU to ensure that people are protected from food-borne diseases. In this regard, it is gratifying that, according to WHO estimates of the global burden of food-borne diseases, Europe is one of the safest places in the world (European Court of Auditors, 2019).

1.1.1 Environmental hazardous substances with an impact on the food chain

According to §2 of Act No. 17/1992 Coll. on the environment, the environment means everything that creates the natural conditions for the existence of organisms, including humans, and is a prerequisite for their further development. The quality of the environment is then reflected in the quality of life of all living organisms that are part of it.

The deteriorating quality of the environment in some regions of the Slovak Republic affects the unfavourable health status of the Slovak population. The morbidity structure of the Slovak population has not changed significantly for a long time, the most important groups of diseases are chronic non-infectious diseases, cardiovascular and cancer diseases. However, these diseases are already threatening the younger population and their share is gradually increasing.

The area of nutrition is also closely connected with the health status of the population. Therefore, stable food security is of strategic interest. One of the eight basic goals of the agricultural and food policy of the Slovak Republic is the adaptation of agriculture to environmental requirements for the protection of soil, water, air, the preservation of species diversity and the protection of traditional gene resources (National Strategy for Sustainable Development of Slovak Republic, 2001).

In connection with the quality of the environment and its impact on the food chain, several chemicals are known which, when incorporated into food, pose a health risk. Their toxic effect and subsequent effect on health is determined not only by their presence in food, but also by the amount that enters the body (dose and frequency) and the duration of exposure. Foreign substances have effects often specific only to certain organs, can affect immune responses, integrate with food nutrients and worsen their biological values. Their late (genotoxic, carcinogenic, embryotoxic, teratogenic) effects have a serious impact with the possibility of influencing future generations.

The intensification of agriculture, especially the use of fertilizers, has a major impact on the environment. Substances that enter the soil from fertilizers leak from it and have a negative impact on water and air quality, threaten biodiversity, deplete the ozone layer and contribute to climate change. Compared to EU countries, the soil in Slovakia contains relatively few nutrients, which leads to higher consumption of industrial fertilizers.

Persistent organic pollutants (POPs) are considered to be particularly feared and dangerous. They are known to be toxic even in minimal concentrations, do not decompose in the long term, persist in the environment for decades (they are persistent) and are capable of transmission over vast distances. They accumulate in the adipose tissue of most living organisms and subsequently in the food chain, so in the highest concentrations they occur at the top of the food chain. Under the 2001 Stockholm Convention (<http://www.pops.int>) on Persistent Substances, 12 POPs with the worst effects on human health have been identified. These are mainly by-products of combustion and chemical production (polychlorinated dibenzodioxins and polychlorinated dibenzofurans), industrial chemicals (hexachlorobenzene and polychlorinated biphenyls) and some pesticides (e.g. chlordane, aldrin and others) mammals, including humans.

Polychlorinated biphenyls (PCBs) are a dangerous chemical substance present in the environment in the Slovak Republic. In nature, they degrade very slowly, they most often get into food through feed, in living organisms they are stored in fat parts, resp. milk. They have been found to cause disorders of the nervous system, reproduction and carcinogenesis in humans (they are hepatotoxic). The zone of contamination with these substances is located in the Slovak Republic from Strážské to Michalovce and ends in the Zemplínska Šírava reservoir. There are almost 250,000 inhabitants living in the region, who are directly or indirectly endangered by contaminated water, soil, plants or animals. From the results of analysis of water from the stream in the vicinity of Strážské, at the bottom of which there are barrels with waste materials generated during production, the permitted limit of PCBs is currently exceeded 15 times (Blaščík, 2020).

Polycyclic aromatic hydrocarbons (PAHs, such as naphthalene, phenanthrene, benzo (a) pyrene) are also serious environmental contaminants. These are chemicals that can have a negative effect on humans, especially in individuals who are exposed to these substances for a long time. PAHs occur in almost all components of living nature, because they are constantly formed by the action of heat during the decomposition of living matter, especially under anaerobic conditions. The highest concentrations of PAHs and similar compounds were found in foods grown near large industrial factories or in foods that have been roasted, grilled, smoked, or otherwise heat-treated at very high temperatures (State Veterinary and Food Administration of the Slovak Republic, 2022).

The possibility of contamination of the environment with radioactive substances is also a serious problem. Various studies have shown that the general public has concerns and distrust of official statements and measures, especially in connection with the production of electricity in nuclear power plants, respectively. with the storage of radioactive waste. However,

agricultural land alone is not the primary source of radioactivity. Soil has a predominantly mediating role, because it captures and binds radionuclides from the atmosphere, surface and precipitation waters, while these radionuclides are subsequently involved in biological cycles through the plant root system (Ferdinandová, 2008).

As far as agricultural land itself is concerned, its contamination is caused by the above-limit content of some hazardous chemicals. From this point of view, some chemical elements (cadmium, lead, nickel, copper, arsenic, mercury, fluorine), as well as polycyclic aromatic hydrocarbons (PAHs) and also polychlorinated biphenyls (PCBs) are at risk. They occur in soils in different concentrations and in different forms and their increased content may be caused mainly by the influence of various anthropogenic activities (industry, energy, transport and agriculture), but it is often typical of mountain areas due to the so-called natural geochemical anomalies (Kročková, 2021).

Of all the chemical elements that enter the food chain from the environment, lead, cadmium, arsenic, and mercury are considered to be the most important (Zmetáková and Šalgovičová, 2006). For plants, the natural source of lead is its content in the soil, which is conditioned by the geological properties of the subsoil. Lead accumulates in the surface layers of the soil, which contributes to its greater cycle in ecosystems, thus significantly increasing its danger to humans and animals. One of the main sources of lead in contaminated soils is emissions from smelters, application of sewage sludge and fertilizers to the soil, transport and gravity deposition (rain, snow, hail) (Peltznerová et al., 2009).

Its residence time is so long that it can be considered a permanent part of the soil (Ďurža and Khun, 2002). Cadmium is an abiogenic element and is one of the most toxic chemical elements, especially in the form of its soluble compounds. Cadmium compounds are carcinogenic in some cases. The source of environmental pollution is metallurgical plants, it also enters the atmosphere by burning low-quality coal and oils. This element enters the soil through wastewater, the application of sewage sludge, compost and, in the past, the application of phosphorous industrial fertilizers made from apatite's imported from Tunisia, Algeria, Morocco, Togo and Senegal (Poláček et al., 2005).

Mercury enters food from natural and human sources. Mercury concentrations in food crops are generally low, with the largest dietary intake coming from eating seafood. Mercury levels in most field crops are low enough to have a detrimental effect on health. As for arsenic, some soils, vegetation and poultry may be contaminated with it because arsenic compounds have been used as insecticides, herbicides and as animal feed additives (Egyúdová and Šturdík, 2004).

The areas with the most contaminated soil in the Slovak Republic are marked in red in the following figure (Fig. 1), in these areas there are above-limit concentrations of hazardous substances in the soil (Kročková, 2021).

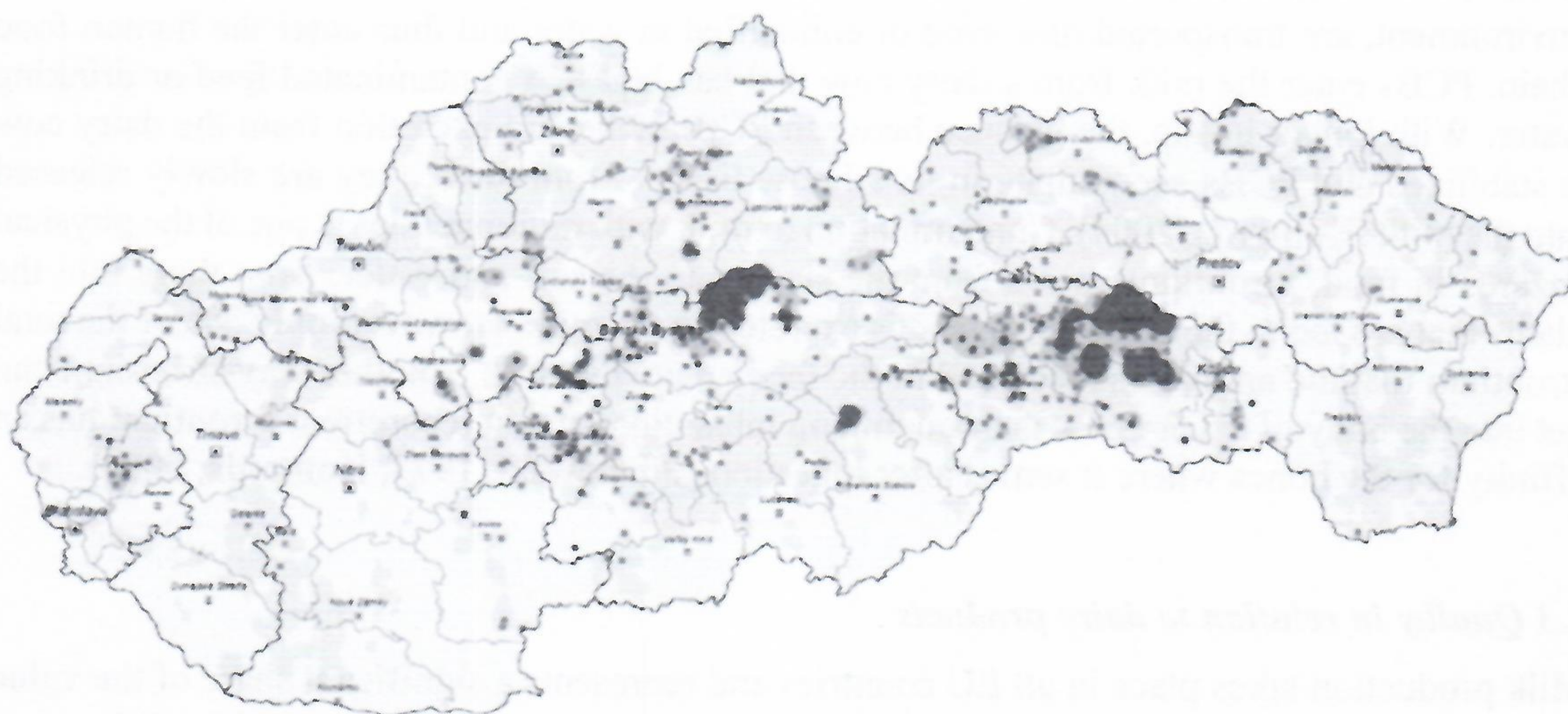


Fig. 1 The most contaminated soil in the Slovak Republic (Kročková, 2021)

1.2. The quality of milk in the context of negative environmental impact

Milk is a food with high nutritional value and is the natural and only food of newborn mammals. It can meet all the nutritional requirements of young during the first stages of their lives, including humans. Milk and dairy products are a key commodity that is crucially used to ensure the proper nutrition of the population. From high-quality milk proteins, a person obtains all the essential amino acids, fat and milk sugar are sources of energy for the body, and the content of water and micronutrients (mineral nutrients and vitamins) is also not negligible. The composition of milk differs qualitatively and quantitatively between individual mammal species (Pijanowsky, 1977).

Kubicová (2004) describe the benefits of milk not only in physiological but also in therapeutic nutrition. However, the diet must be limited, resp. completely eliminated in the absence of the enzyme lactase or when it causes other difficulties (meteorism, diarrhea, constipation, etc.). Health problems after consuming milk also arise in some diseases of the gallbladder, pancreas and intestines.

However, milk is a food that, due to its natural composition and origin, is easily accessible to environmental contaminants. Practically all serious environmental contaminants (pesticide residues, POPs, PCBs, PAHs, heavy metals - cadmium, arsenic, lead and mercury) are dangerous with the possibility of accumulation in milk, especially milk fat is prone to their occurrence.

Pesticides, as foreign substances, enter food by agricultural chemistry. If animals are fed feed that has been treated with pesticides, these hazardous contaminants can enter meat, milk and dairy products. Food can also be contaminated if it is treated with pesticides for long-term storage (Egyúdvová and Šturdík, 2004). Pesticide residues may be present in the milk, although the risk associated with consuming milk containing excessive amounts is currently low. However, even products that are no longer used persist in the environment and are consumed by dairy cows together with feed, thus passing into milk. Pesticides can also enter milk when used to kill insects in cowsheds. Prohibited pesticides that still persist in the environment include, for example, DDT (dichlorodiphenyltrichloroethane), HCB (hexachlorobenzene), HCH (hexachlorocyclohexane) and lindane (Komprda, 2004). Polychlorinated biphenyls

(PCBs) have not been produced for several decades, but their residues still persist in the environment, are transported dissolved or emulsified in water and thus enter the human food chain. PCBs enter the milk from a dairy cow that has ingested contaminated feed or drinking water. With longer intake, the balance between PCB intake and excretion from the dairy cow is stabilized and PCBs accumulate in its adipose tissue. From there, they are slowly released into the milk (Komprda, 2004). Contamination of milk with radionuclides is one of the physical hazards in food. Strontium passes from the slope into the soil and water, from there into the plants that are fed to the dairy cows, and is excreted in the milk. However, only 3% of the total strontium that the animal has received in the feed enters the milk. Another way strontium can get into the body of a dairy cow is through lung inhalation or skin resorption. Strontium has an affinity for the bones where it settles after ingestion (Pijanowski, 1977, Komprda, 2004).

1.3 Quality in relation to dairy products

Milk production takes place in all EU countries and represents a significant share of the value of agricultural production. Total EU milk production is estimated at around 155 million tons per year. The main producers are Germany, France, Poland, the Netherlands, Italy and Spain. However, there is also trade with non-EU countries. Import licenses and import duties shall apply to preferential imports.

The annual consumption of dairy products is also important information. In general, there is a pleasing growth trend in Slovakia. According to the WHO, each person should consume 220 kg of dairy products a year. Although this figure is not reached or exceeded in the territory of the Slovak Republic. The average annual consumption of dairy products in the Slovak Republic is at the level of 173.6 kg.

The reason may also be self-sufficiency in the production of raw milk in particular due to the decline of dairy cows and entire farms, and thus our producers are unable to compete with foreign producers. In August 2019, the 2muse agency (<https://www.2muse.sk>) conducted a survey of a sample of 1,019 respondents, where they were interested in which qualitative criteria of Slovak dairy products they are most interested in when buying.

61% of respondents identified quality as the most important factor, followed by price, third place of origin and third place freshness. The President of the Slovak Dairies, Mr. Voska, believes that the quality and freshness of the dairy sector's products should be a priority in the attention of consumers. In our opinion, and following previous findings from our contribution, this is also the country of origin. If the product names have a special link to the place where they are produced, a so-called geographical indication. Thanks to the recognition of a geographical indication, the consumer can distinguish a quality product and trust it. On the other hand, geographical indications help producers to sell products better. Such products are listed in the so-called register of quality products. The registers also contain information on the geographical and production specifications of each product.

It must be said that Slovak dairy products, unlike imported food, have not yet been the subject of any serious food scandal.

2. Data and Methods

In the processing of our contribution, secondary information sources from available surveys conducted by recognized authorities in the subject area were used. We also used searches from available literary sources, EU regulations, strategic documents of the Ministry of the Environment of the Slovak Republic and analysis of the Dairy Fund of the Slovak Republic.

We used the methods of comparison, induction and deduction and we used partial results of our own research.

3. Results and Discussion

The result of our findings is that food quality is closely linked to the environmental quality of a particular geographical area and that all parts of the food chain contribute to their quality. From its primary link to the finalization and distribution of food, the food chain is open to the penetration of contaminants from all material and intangible inputs into production (pesticides, fertilizers, biologically active substances, soil, air, water), which adversely affect on the plant and animal food raw materials. The most serious substances that are also found in the environment in the Slovak Republic include heavy metals (arsenic, cadmium, mercury and lead) and various organic substances belonging to the groups of polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and persistent organic pollutants (POPs). All of them are characterized by a high degree of biotoxicity to warm-blooded animals and humans.

Milk and dairy products are examples of food endangered by environmental contaminants. We chose this example because milk has an exceptional position in the nutrition of humans (and mammals in general). It is a food of high nutritional value and is a natural and only food for new-born mammals. However, milk is a very "vulnerable" food, due to its origin, composition and technological processing possibilities within the food chain. Various environmental contaminants, especially from the group of organic substances (PCBs, PAHs, POPs) are concentrated in milk fat, in which they are well soluble and thus stable. In addition, milk can also be contaminated with radioactive substances that are present in the environment around nuclear power plants. From this point of view, isotopes of some elements, especially strontium, iodine and cesium, are dangerous. Therefore, the aim was to show, on the example of milk and dairy products, a close link with the geographical area, the quality of the environment and the quality focused on the whole transformation process from inputs to outputs.

With our contribution, we wanted to emphasize in the general and on the special example as well the importance and impact of the environment on the quality of human life in the context of the food base and products quality.

4. Conclusion

Nowadays places great emphasis on quality of life, good lifestyle, the prevention of diseases of civilization and new innovative forms of food processing. However, the environment will appear to be very important, which can significantly affect the quality of inputs into the transformation process. It is known in quality management that only quality inputs can mean quality output. When buying food products, customers will have to reconsider their usual habits and instead of price as the main attribute of product quality, they will have to take into account the geographical area or the quality of the environment from which the product they buy comes. Finding relevant information is sometimes impossible in a globalized environment. Deviations from quality will be detected in most cases only if a food scandal occurs. However, the subsequent quality control does not correspond to the HACCP philosophy, which focuses more on prevention.

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