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Sustability of food safety management in Slovakia

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Abstract. The sustainability of food security has been the subject of much attention by researchers over the last decade. Intensified research has been triggered by food price crises, which have led to an increase in investment to avert undesirable developments. Despite these steps, food insecurity is still a significant problem. The sustainability of food security is closely linked to the consequences of an inappropriate lifestyle, the consequences of a lack of solidarity, and the consequences of inappropriately set policies. We have designed processes that cover food security. We collected data on the frequency of research of defined processes of food safety in the period from 2009 to 2020. We examined the development of respondents' views on individual processes. In the time series, we have identified a short phase of decline, a phase of stability, and in recent years we have seen a phase of significant growth. Correlation analysis suggests that certification is a priority process. We also examined selected indicators that can be used effectively to manage and measure food safety. We have defined selected indicators. We also examined the correlations of the links between selected indicators and food security.

1 Introduction

In this article, we will focus on the sustainability of food security. We are based on the experience of other countries whose food security is already a serious problem today. We can learn, see and explore the reasons for indications of a problem that may occur in our locality in the future. Our goal is to identify the areas on which the sustainability of food security is based in the future. For example, on good agricultural, environmental and other policies. We are looking for an optimal model for defining food safety and its sustainability in the long term. We have defined selected processes and indicators. We have examined the links and dependencies in order to ensure the sustainability of food security in the future in our region.

2 The current state of Knowledge

Food security has been the subject of much attention in scientific research in recent years. [2] Intensified research has been triggered by food price crises, which have led to an increase in investment in agriculture, despite this move, food insecurity is still a major problem. The sustainability of food security is likely to be closely linked to the consequences of an inappropriate lifestyle and the consequences of a lack of solidarity in recent decades. [1] The potential effects of climate change on the growth and yield of scientists' crops lead to the conclusion that the soon-to-be-expected reductions in CO 2 fertilization will lead to a reduction in food production. Similarly, simulations of maize production in Africa and Latin America using climate data from the HadCM2 model to generate characteristic daily weather data for 2055 predicted an overall reduction of 10%. [3] These and other similar projections use a crop production model to link the climate to plant physiological processes. The yield can then be modeled on a single crop and then increased to a larger area, usually within some form of geographic information system. It is questionable whether to increase the area for growing food. Climate change, along with other global environmental changes (changes in water availability and land cover, and changed nitrogen availability and others), are strongly influenced by human activity and raise concerns about achieving food security for all people. [4], [5] There is also concern that meeting global food demand as a result of changes in dietary preferences will further worsen the environment through further destruction of native vegetation and increased crop intensification. [6] This in turn can further disrupt the food systems on which food security is based. Global environmental change, energy waste, bad political decisions or unworkable political decisions are starting new processes that will need to be addressed subsequently: the sustainability of governance in food security solutions, the sustainability of governance, which is highly complex due to delays. problem solving, the sustainability of the current institutional architecture, the sustainability of the requirements for coherence and coordination at different levels, the sustainability of variation and conflict of ideas, the sustainability of the requirements for allocating sufficient resources to food security management. Much of the literature on food safety management is characterized by an optimistic perspective on governance as a problem-solving mechanism. Alternative management perspectives can be strengthened by the current understanding of food safety management. Food security management as an area of research could move forward by engaging in further empirical examination of current management mechanisms, especially at sub-national level. [7], [8] For these reasons, food security has become the subject of further research. [9] Sustainability developments are based on the oft-held notion that food security solutions [18] or approaches should not only focus on the technical and environmental dimensions of the

problem, but should also take into account social, economic and political aspects. [10]; [11]; [12]; [13] state that the unsustainability of idealistic plans, including new technologies, is an advanced management strategy. This concept of governance has been researched and developed and focuses on interactions within and outside food systems [14]; [15] and covers factors such as food prices, trade in agricultural products, poverty reduction, infrastructure, education and crisis management.[16] In examining the current state of knowledge of the level and development of food security, we also came across research aimed at systematizing publications on food security. The literature on food safety management has been categorized by scientific studies according to various criteria / characteristics /. There is a mapping of the history of the literature on food safety. A citation report from the ISI Web of Nowledge Journal suggests that the various journals in which the 33 included academic articles have been published cover a wide range of natural and social sciences. These fields include international relations, food sciences and technologies, sociology and economics. Of all the journals that contained articles on food safety management, only one journal had more than two articles, which, together with the categories of journals, indicates the spread of attention among different disciplines and communities. This fact also indicates the seriousness of the situation in the field of food security but also the development of the situation over time. Regarding the years in which the documents were published, an upward trend can be observed since 2009. While none of the years before 2009 contains three or more documents, it increases to five and four in 2009 and 2010, to ten, twelve and nine in 2011, 2012 and 2013. This observation confirms the notion that the recent food crises have been the impetus for increasing food safety research in general. [17] These events have made it clear that, despite decades of efforts to eradicate hunger and malnutrition, food insecurity is still a significant problem.

3 Methodology and Methods

The aim of this article is to examine selected indicators of the state and development of food security sustainability and to examine interdependencies. To achieve this goal, we have used recognized general scientific methods. Empirical methods were used in the study of the literature to obtain information. Registration information is accompanied by observation of phenomena from different angles. In this context, it used the comparison method. The system concept used in the processing of the obtained information is a general methodology of research and enables the distribution of the phenomenon of partial problems without disturbing the overall context and connections. This approach allows a comprehensive study of selected objects. In addition to the alleged methods, more generally accepted methods of scientific research were used, especially the basic and most common methodologies such as analysis and synthesis. The analysis was used to determine the links between the parts of the whole, their complementarity and impact. Synthesis that compared with the analysis of the phenomenon of reverse. This allowed us to formulate generalizations. In the paper we used mainly general methods - this is the use of generally applicable methods in creative activity: analysis - detailed description of individual problems in solving individual problems, synthesis - combination of information obtained in individual parts of the problem, induction - process applied in each step of the project from individual to more complex, deduction - a process applied in the focal stages of the solution creating a complex judgment from previous information, analogously - solving a model of deduction based on comparative characteristics of comparable subjects for the required subject, synergy - adequate complex combination of relevant methods in solving a specific problem system approach - classification and categorization of the system according to representative criteria, comparison - comparison of selected attributes according to representative criteria, abstraction - concentration on the central focus of the investigated phenomena and ignoring irrelevant phenomena. The source of information for the processing of the submitted results was realized in the online space. on place of Slovak Republic. The subject of the survey was the opinions of anonymous respondents on the structure of food safety processes in the period from 2009 to 2019. The selection of respondents was not limited by any criteria. The selected respondents were from different regions. The industry has not been defined. The aim of the research is to verify or refute the hypotheses. H0: There is no dependence between the qualitative features A and B, respectively there is no association. H1: There is a dependence between qualitative features A and B, respectively there is an association. The test characteristic 2 - which has 2 - a distribution with (r - 1) (s - 1) degrees of freedom, where r is the number of categories of the variable A and s is the number of categories of the variable, is used to verify the hypotheses. We performed the analysis in a statistical program.

4 Result and discussion

The current state of sustainability of food security poses many risks for the future. It is not possible to solve this problem overnight. Current events and past research show that it is necessary to expect food security problems in the future, for which we must be prepared. The reason is the results of research in this area, which has already been addressed by scientists in the past. These researches, forecasts and developments in recent years suggest that serious food security challenges will need to be addressed in the coming decades. In our research, we build on the review of food security issues in the past. We provide a brief summary in the introductory sections of this article. The field of food security is likely to depend on many factors that still affect it today. We have not found a comprehensive approach in the research that has already been carried out, taking into account all the factors that have an impact even today. These include climate change, policies, innovation and processes, which influence many indicators of food security developments. We cannot take global developments lightly either, which also indicates that, in the area of food security, it is essential to implement preventive security measures now. Following the research carried out so far, we have decided to dedicate this contribution to preventive measures in the field of food safety, their setting and research. Today, food security problems can be identified in various parts of the world. It might seem to the uninitiated that the vast majority of European countries are not affected

by this problem. We base our thinking on experiences and solutions that have been explored in other parts of the world. Food security is a major challenge for the future. We focus our research mainly on Slovakia. We can already see negative signals and trends in the area of Slovakia's food independence. In this area, it can be seen that the level of self-sufficiency in food security in Slovakia is insufficient and shows a declining trend of several indicators. The long-term sustainability of such developments is very questionable without effective measures being put in place. Given the scope of this article, we decided to focus our research on the sustainability of the food safety audit. Based on the existing knowledge, we have identified the most important processes in the field of food safety: monitoring, the audit itself, monitoring, investigation, verification, certification and supervision and food safety. We consider the study of these processes to be the first phase of our analysis. From the available data, it is clear that these historical processes showed a stable development from 2012 to 2016.

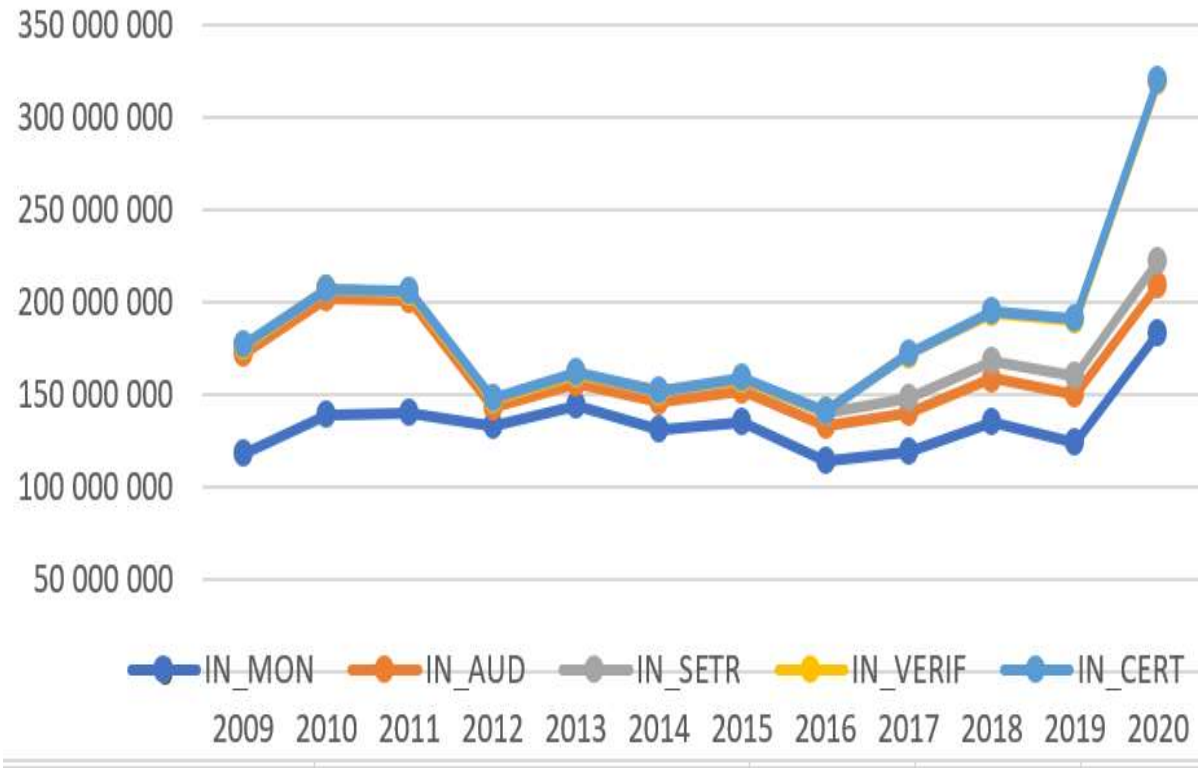

Fig. 1. Development of selected indicators in the field of food safety
Source: Own processing of respondents' opinions.

According to the respondents, the monitoring of food safety is relatively stable in the time interval from 2010 to 2016. According to the respondents, this stability is accompanied by a slight downward trend. The investigation and especially the certification show relative stability from 2009 to 2020. The survey indicates a slight increase trend. The opinions of the respondents show / suggest / since 2019 an increasing trend in the area of monitoring and in the area of verifica -tion. In general, we can state that in the period from 2010 to 2012, according to the respondents, it shows a declining nterest in food security. On the contrary, in the years 2016 to 2018, it shows a slight decline in interest in the already mentioned selected food safety indicators. Since 2019, the number of respondents has been significantly increasing, indicating an intense trend of declining interest in monitoring, auditing, investigating, verifying and also certifying food safety processes. In percentage terms, however, we have seen a slight decline in monitoring, audit and investigation since 2016.

In the second phase of the research, we focused on finding a correlation between selected indicators and food safety. There is no agreement between international food safety authorities on specific indicators in the field of food safety. However, there are suggestions for sets of indicators. For example, in 2017, the Food and Agriculture Organization of the United Nations (FAO) categorized 139 food safety indicators. We performed the analysis of the obtained / collected / data in three phases of our examination of the mutual correlation of selected indicators. First, we examine the correlation of selected indicators, which we have already described in the fourth part. They represent respondents' views on food security. Respondents' opinions on monitoring, audit, investigation, verification and certification in the field of food safety. The results of our correlation research suggest: - the development of monitoring correlates with the development of savings, with the development of certification. From this result we can conclude that the process of food safety verification and food safety audit are detached from the process of food safety investigation and certification. In other

words, not all / monitored food safety processes are linked. - food safety audit correlates with food safety certification, with food safety investigation. The correlation with food safety certification and verification is very close to the correlation. From this point of view, we can state that the respondents / favored / chose certification as the most effective process for ensuring the sustainability of food safety.

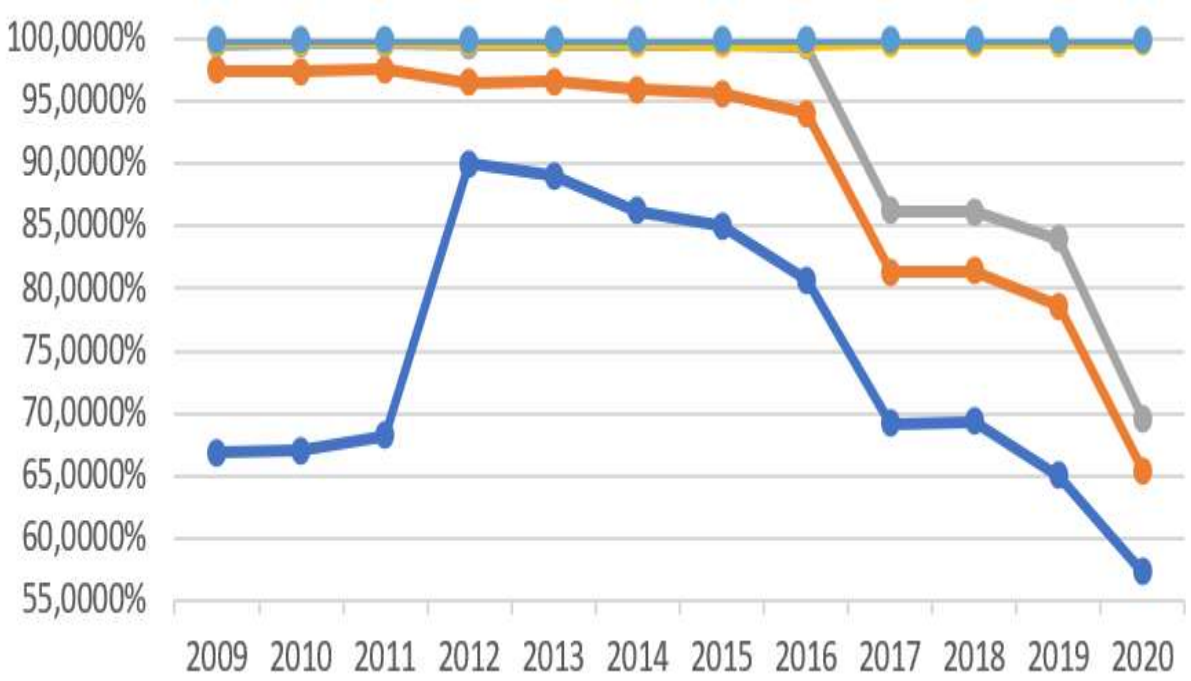

Fig. 2. Development of selected indicators in the field of food safety in%
Source: Own processing of respondents' opinions.

The next step in examining the correlation was how the processes related to food security correlate with real numbers, which can be obtained in standard statistics. For which there are historical statistics in time series. In conclusion, it can be stated that these are selected data that we drew from one source to make the data comparable. Due to the largest range of available statistical data in the field of food safety, we drew data from the source konema.com. Given the availability of data, we have selected the following indicators: gross domestic product per capita, public debt, poverty index, population development, birth rate development, food production development, livestock production development, crop production development, cereal production development, extent of agricultural land used , developments in fertilization and developments in added value in agriculture. We can state the correlation of monitoring and certification with the development of poverty, with the development of birth rates, with the development of food production, with the development of crop production. The food safety audit correlates with the development of food production. The food security survey correlates negatively with the development of cereal production, the development of fertilizer consumption and the development of added value in agriculture. The audit correlates with the development of cereal production and from the results of examining the correlations within selected statistical indicators can be summarized: - the correlation of the development of GDP was identified with the development of poverty, with the development of the birth rate, with the development of the population, with the development of cereal production and with the development in the extent of land use of the economy. Public debt correlates with the development of poverty, with the development of birth rates, with the development in animal production, with the development of crop production, with the extent of agricultural land use, with the development of added value achieved in agriculture

Table 1. Corelation of selected indicators

	IN_MON	IN_AUD	IN_SETR	IN_VERIF	IN_CERT	HDP_ob	DLH	CHUDBA
IN_MON								
IN_AUD								
IN_SETR	A							
IN_VERIF								
IN_CERT	A	A	A	AA				
HDP_ob								
DLH								
CHUDBA	A					A	A	
POPUL						A		
POROD	AA					AA	AA	AA
PROD_PO	A	AA						A
ZIV_VYR							AA	AA
RAST_VYR	A						A-	A
VYR_OBIL			A-	A	AA	A		
PODA						AA	AA	AA
HNOJE	A		A-					A
PR_HOD_I	A-		A-				A	A

	POPUL	POROD	PROD_POT	ZIV_VYR	RAST_VYR	VYR_OBIL	PODA	HNOJ
IN_MON								
IN_AUD								
IN_SETR								
IN_VERIF								
IN_CERT								
HDP_ob								
DLH								
CHUDBA								
POPUL								
POROD								
PROD_POT								
ZIV_VYR		A						
RAST_VYR		AA	A					
VYR_OBIL								
PODA	AA	A-						
HNOJE		AA		AA		A	A	
PR_HOD_P		AA		AA	A	A		A

Source: Own processing, data from own survey of respondents, knoema.com [19], [20]

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5 Conclusion

In conclusion, several studies have addressed food safety in the last decade. These studies focused on regions developing different cultural conditions. They give us few opportunities to learn how to better manage food security in the future. Food safety is not precisely defined in the literature. We have designed processes that cover food security. We collected data on the frequency of research of defined processes of food safety in the period from 2009 to 2020. We examined the development of respondents' views on individual processes. In the time series, we have identified a short phase of decline, a phase of stability, and in recent years we have seen a phase of significant growth. Correlation analysis suggests that certification is a priority process. We also examined selected indicators that can be used effectively to manage and measure food safety. We have defined selected indicators. We also examined the correlations of the links between selected indicators and food security.

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