
FOOD SECURITY AND COMPARATIVE ANALYSIS OF SITUATION IN SERBIA AND NEIGHBOURING COUNTRIES

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ABSTRACT

The concept of food security has expanded significantly over time, and due to its importance, it is on the list of priorities of the UN Sustainable Development Goals. The aim of this paper is to analyze the state of individual dimensions and key indicators of food security in Serbia and selected neighboring countries using the Global Food Security Index (GFSI). The index was created in 2012 by the Economist Intelligence Unit and it is calculated every year to measure the risk of food insecurity in individual countries. The latest data indicate that Serbia has the worst rank among the neighboring countries. The analysis showed that two GFSI indicators for Serbia (gross domestic product per capita and public expenditure on agriculture) are the worst evaluated and represent the main limitations of improving food security in Serbia.

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Introduction

Food security is one of the UN Sustainable Development Goals (SDG) and the international community is committed to eliminate hunger and all forms of malnutrition by 2030 (UN, 2015; FAO, 2015). The number of inhabitants in the world is continuously increasing, and there is a tendency that an increasing share of the population lives in urban areas. Rapid technological development is accompanied by increasingly strong ties between individual economies, i.e. globalization. However, the world economy is not achieving the expected growth, especially in some countries, which, together with the existence of conflicts and political instability, causes pronounced migrations of population. Climate change and severe extremes are affecting agricultural productivity, rural environment and natural resources which cause the decline in number of farmers. All of this has led to major shifts in the way food is produced, distributed and consumed globally, and to new food security (FAO, 2019).

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The presence of hunger in the world is expressed by the prevalence of undernourishment. After decades of reducing hunger in the world, the trend of world hunger reverted in 2015, when the number of malnourished people increased. In the following years, the prevalence of undernourishment in total population is continuously around 11%, although in absolute terms this number is increasing. More than 820 million people in the world are still hungry, which is a significant challenge for achieving the Zero Hunger target by 2030 (FAO, 2019). There is only a decade left and the latest data show that the aim is far from being fulfilled. Many countries have higher hunger level than in 2010, and some require urgent attention in reducing level of hunger (IFPRI, 2019).

The problem of quantity and quality of nutrition differs depending on the level of development of individual regions or economies. While the fight against undernourishment and malnutrition is a burning issue in developing regions, developed countries face problems such as overweight and obesity, food safety, and food waste in supermarkets, restaurants and households (Božić and Papić, 2019). It is estimated that over two billion people in the world do not have regular access to safe, nutritious and sufficient food, including 8% of the population in Northern America and Europe. At the same time, there is an increase in the number of obese and overweight people. It is estimated that in 2016 about 41 million children under the age of five (about 6%) were obese (FAO, 2017). “In 2016, 131 million children 5–9 years old, 207 million adolescents and 2 billion adults were overweight. About a third of overweight adolescents and adults, and 44% of overweight children aged 5–9 were obese.” (FAO, 2019).

Measuring food security, i.e. the selection of adequate indicators, is a very complex issue. With the change of the concept of food security and the increasing number of dimensions that are included, the number and type of indicators that measure these aspects have changed (Božić and Papić, 2019).

This paper aims to analyze the state of food security and its individual dimensions in Serbia and selected neighbouring countries (Bulgaria, Romania, Hungary and Greece) in 2018 and 2019 by comparing the Global Food Security Index (GFSI). This is one of the most commonly used indicators that describe and measure different dimensions of food security. The starting hypothesis in this paper is that Serbia lags behind the selected neighbouring countries in terms of food security measured by the GFSI.

Materials and methods

During the research for this paper, foreign and domestic literature was used, and the reports of institutions dealing with food security issues, such as: IFPRI, FAO, EIU, UN, were analyzed.³

3 IFPRI – International Food Policy Research Institute, FAO – Food and Agriculture Organization of the United Nation, EIU-Economist Intelligence Unit, UN – United Nations.

The Global Food Security Index was used to analyze the state of food security in Serbia and chosen countries in the region. GFSI is an annual index created for comprehensive measurement and monitoring of food security, and its components in individual countries worldwide. It has been calculated since 2012 by the Economist Intelligence Unit (EIU). GFSI is a tool for measuring food security at the national level that includes indicators of affordability, availability, quality and food safety (EIU, 2017). The index is based on a large number of factors that affect the food system, i.e. the food security of the country, from political stability to climate threats.

A detailed methodology of calculating the GFSI index is presented in the next part of the paper. In addition to the analysis of documents, during the preparation of the paper, a comparative method was used in order to evaluate the position of Serbia in relation to the neighbouring countries.

Theoretical framework of research

The concept of food security has ‘evolved, developed, multiplied and diversified’ (Shaw, 2007). This concept first appeared in 1943 at a conference in Virginia, USA during World War II. During this conference, the idea was adopted that it is necessary to provide all people with a safe and adequate supply of food. Over time, the concept of food security becomes more complex, and in addition to availability of food, the issue of economic and physical access to food is introduced. Therefore, at the World Food Summit held in 1996, food security was defined as state where “all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 1996).

Starting from the previous definition of food security, four main dimensions of food security can be identified: availability, access, utilization and stability. These dimensions must be fulfilled simultaneously in order to achieve food security.

- ~ Physical availability of food questions the supply and it determines if there is enough food present from production, reserves, market and net trade.
- ~ Economic and physical access to food is related to level of households and it concerns whether or not households and individuals have sufficient access to food, assuming that the previous level is achieved and that there is enough food on national level.
- ~ Food utilisation answers the question of maximizing the consumption of adequate nutrition and energy. It determines the nutritional status of individuals, which means that a person take sufficient energy and nutrient from the available and accessible food.
- ~ Finally, stability of the other three dimensions over time questions if the whole system is stable, so households and individuals can have previous dimensions fulfilled continuously, and not on periodic basis. Stability can be threatened by climatic economic, social and political factors (FAO, 2019).

There are a large number of indicators that measure food (in)security. Hoddinott (1999) state that there are about 200 definitions and 450 indicators of food (in)security. Pangaribowo et al. (2013) emphasize that indicators can be separated into three groups that measure (1) the outcomes of food insecurity; (2) the drivers and risks of creating food insecurity (percentage of the population living below the poverty line, yield per hectare, hygienic conditions in the household, etc), and (3) the interventions in solving the problem of food insecurity. Indicators that are most commonly used are: FAO Indicator of Undernourishment, Global Hunger Index, calculated annually by the International Food Policy Research Institute; and the Global Food Security Index, which is calculated annually by the Economist Intelligence Unit (Božić and Papić, 2019).

After food crises in 2008 and 2011, EIU created the Global Food Security Index in 2012. It measures food security at national level. Aim is to assess risks and determine which countries are most and least vulnerable to food insecurity. This index measures food security comprehensively, trying to determine factors that affect it.

The GFSI is constructed from 34 underlying unique indicators that are grouped in indicators and then in three dimensions: Affordability, Availability and Quality & Safety (Table 1).

Table 1. Comparison of food security and GFSI conceptualisation

Standard Conceptualization of Food Security	GFSI concept
Physical availability	Affordability
Economic and physical access to food	Availability
Food utilisations	Quality and Food Safety
Stability	Natural Resources & Resilience (since 2017)

Source: Authors' modification based on Thomas et al., 2017

Additional adjustment factor, Natural Resources & Resilience, was added in 2017 iteration in order to capture the impact of climate change and natural resources on food security (EIU, 2017). This factor includes additional 7 indicators (Table 2). All indicators are scaled from zero to 100, where 100 is the most favourable score. The final value of the GFSI is a simple weighted average of first three category scores, while the Natural Resources & Resilience category is an adjustment factor. The fourth category serves to view how food security is changing when climate-related and natural resource risks are taken into account (EIU, 2019).

Affordability is related to the capacity of country's population to pay for food, both in times of stable and insecure food supply. Availability refers to country's capacity to produce and distribute food, and to provide self-sufficiency in food. It also shows how easy it is for consumers to access food products.

Quality and safety represents "the nutritional quality of average diets and the food safety environment of each country" (Thomas et al., 2017). Safety and quality of food affect health and socio-economic environment of a country, and it can be measured by

examining nutritional standards applied in the country, diet diversification and protein quality provided to people (Ali, 2018). Natural Resources and Resilience assesses a country's exposure to climate change, and sensitivity to natural resources, i.e. it evaluates how country is reacting to such risks (EIU, 2019).

The GFSI index can be analysed using adjustment factor or without it. The first three dimensions give a fair evaluation of food security in the moment of analysis, but they do not show the stability of situation. Including correction (adjustment) factor related to natural resources and climate changes provide an insight to food security, but it "also reflects future stability in the index" (Ali, 2018).

In addition to changes made in 2017 (including dimension of Natural Resources and Resilience), in 2019 GFSI introduces new metrics indicators (as shown in Table 2). Although most indicators remain the same, it is not possible to compare 2019 data with previous years, with exception of 2018 where scores and ranking were updated to be directly comparable. Due to this, analysis in this paper was limited to 2018 and 2019.

Table 2. Conceptual framework of the GFSI index in 2019 iteration

Affordability	Availability	Quality & Safety	Natural Resources & Resilience
Change in average food costs	Sufficiency of supply (kcal/per capita/per day)	Dietary diversity	Exposure (temperature rise, drought, flooding, storm severity, sea level rise, commitment to managing exposure)
Proportion of population under global poverty line	Public expenditure on agricultural research and development	Nutritional standards	Water (quantity, quality)
Gross domestic product per capita (US\$PPP)	Agricultural infrastructure	Micronutrient availability	Land (land degradation, grassland, forest change)
Agricultural import tariffs	Volatility of agricultural production	Protein quality	Oceans (ocean eutrophication, marine biodiversity, marine protected areas)
Presence of food safety-net programme	Political stability risk	Food safety	Sensitivity (Food import dependency, Dependence on natural capital, Disaster risk management)
Access to financing for farmers	Corruption		Adaptive capacity (early warning measures, national agricultural risk management system)
	Urban absorption capacity		Demographic stress (population growth, urbanisation)
	Food loss		

Source: Systematization of authors based on Economist Intelligence Unit, 2019.

The GFSI is calculated for 113 countries, which were selected based on regional diversity, economic importance, population size and with the aim to include regions around the globe. Countries with larger populations were selected so that a greater share of the global population is represented. Serbia is the only country included in

GFSI report from the ex-Yu territory. Following neighbouring countries are selected for comparison: Bulgaria, Romania, Hungary and Greece.

In addition to its comprehensiveness advantages, GFSI has certain weaknesses: a) the value of GFSI does not provide a clear picture of what factors led to the current result; b) there is no clear theoretical concept that explains why these indicators were chosen to represent the three basic dimensions of food security; and c) the quality and safety dimension only partially covered all aspects of food usability. Specifically, problems that exist in the environment and affect food (in)security, such as access to drinking water, health care, etc. have been completely neglected (Pangaribowo et al., 2013). Including the fourth dimension – Natural Resources & Resilience in the calculation of GFSI (2017), part of the mentioned weaknesses has been eliminated.

Results and Discussion

Comparative analysis of food security in Serbia and neighbouring countries

The Global Food Security Index (GFSI) was used to assess food security in Serbia and the neighbouring countries. Singapore and Ireland are the countries with the highest level of food security, followed by Switzerland, Finland and Norway (Table 3). The lowest value of GFSI is in countries that have overcome conflicts, such as Venezuela, Burundi and Yemen, which is also characterized by increasing dependence on food aid.

Serbia is ranked on 59th place with an index of 62.8.⁴ All neighbouring countries, for which GFSI was calculated in 2019, have better rank in terms of food security. Among European countries, Serbia occupies the penultimate position and is ranked 25th (only Ukraine is ranked on lower position). The reduced GFSI score and worsened food security in 2019 compared to 2018 are characteristic only for Serbia and Romania from the analysed group of countries.

In 2017 the EIU included the dimension of natural resources and resilience in the calculation of the global food security index, in order to evaluate future threats to food security, especially climate change. According to this indicator, which includes issues such as droughts, floods and rising sea levels, land degradation, ocean eutrophication, etc. the Czech Republic is the best ranked, followed by Finland, Denmark and New Zealand.

When analyzing GFSI with included component risk of natural resources and resilience to climate change, it is evident that the overall score of GFSI is declining in all countries. By including the correction factor, Singapore dropped from the first to 12th position, and the value of the index decreased by 12.6 points (EIU, 2019). Ireland, Finland and Switzerland are the best ranked countries in the world in terms of food security which includes the risks of natural resources and resilience to climate change. According to the index calculated in this way, Serbia is ranked better by five places and placed on the 54th position, but still is the worst positioned of all neighbouring countries (Table 3).

4 Serbia is sharing rang 59 with Ghana and Morocco, which also have overall score 62.8.

The food system is highly susceptible to the effects of natural factors, particularly to climate change. The future of agriculture and global food production is highly dependent on natural resources. However, agriculture can also have harmful effects on the environment. Research shows that food production causes up to 30% of global greenhouse gas emissions and uses about 70% of total fresh water. Excessive use of chemicals such as nitrogen and phosphorus, used in fertilizers, are the cause of the increased water and soil pollution. Some countries suffer large food losses due to climate catastrophes (floods, droughts, earthquakes, storms, volcanic eruptions). Climate change will continue to affect the quality and safety of food as well as the deterioration of its nutritional values (EIU, 2019). Therefore, countries should establish systems to mitigate long-term effects, as well as effective early warning mechanisms to prepare for changing weather and climate events.

Table 3. Top five countries, Serbia and neighbouring countries according to GFSI in 2019

Country	Score		Rank		GFSI adjusted by the fourth dimension: Natural Resources & Resilience			
	2019	Change 2019/2018	All countries	Europe	Score		Rank	
					2019	Change in score without fourth dimension	2019	Change in ranking without fourth dimension
Singapore	87,4	0,0	1	-	74,8	-12,6	12	-11
Ireland	84,0	+0,6	2	1	77,9	-6,1	1	+1
USA	83,7	+0,6	3	-	75,6	-8,1	7	-4
Switzerland	83,1	0,0	4	2	77,3	-5,8	3	+1
Finland	82,9	0,0	=5*	3	77,5	-5,4	2	+3
Norway	82,9	+0,5	=5	3	76,5	-6,4	5	-
Bulgaria	66,2	+0,5	51	24	60,5	-5,7	47	+4
Hungary	72,7	+0,1	34	19	67,2	-5,5	28	+6
Romania	70,2	-0,2	38	21	64,3	-5,9	34	+4
Greece	73,4	+0,8	31	17	66,9	-6,5	29	+2
Serbia	62,8	-0,4	=59	25	56,9	-5,9	54	+5

* Sign “=” before the rank number means that the country share the rank with other countries with same score value

Source: Authors' processing and interpretation of data based on the Economist Intelligence Unit, GFSI 2019 and the EIU database

The analysis of food security according to certain dimensions (affordability, availability, quality and safety and natural resources & resilience) in Serbia and selected neighbouring countries indicates the existence of certain differences (Table 4). All neighbouring countries achieved a better score from Serbia for following three dimensions: affordability, availability and food safety. According to the availability, Serbia is also positioned on the lowest rank in relation to all components of food security.

The component Natural Resources and Resilience to adverse climate-related and other risks was included in the calculation of GFSI recently (in 2017) precisely because they pose long term threats and impact on food systems and food security across countries. With the value of this indicator of 62.2, Serbia is ranked significantly better compared to other components (on 37th place), but all analyzed neighbouring countries have higher values of this component.

Table 4. Values of GFSI and individual dimensions of food security for Serbia and selected neighbouring countries for 2019

	Serbia			
	Score		Rank (113)	
Overall	62,8		=59	
Affordability	73,9		52	
Availability	53,0		83	
Quality and Safety	61,8		56	
Natural Resources & Resilience	62,2		37	
Overall with Natural Resources & Resilience	56,9		54	
	Bulgaria		Romania	
	Score	Rank (113)	Score	Rank (113)
Overall	66,2	51	70,2	38
Affordability	79,0	36	79,3	34
Availability	54,2	81	64,3	36
Quality and Safety	66,8	48	64,1	52
Natural Resources & Resilience	65,3	=24	66,2	23
Overall with Natural Resources & Resilience	60,5	47	64,3	34
	Hungary		Greece	
	Score	Rank (113)	Score	Rank (113)
Overall	72,7	34	73,4	31
Affordability	80,8	31	77,8	=39
Availability	66,1	30	64,9	33
Quality and Safety	70,5	43	86,0	11
Natural Resources & Resilience	69,5	12	64,8	=28
Overall with Natural Resources & Resilience	67,2	28	66,9	29

Source: Economist Intelligence Unit, GFSI 2019 and EIU database

Comparative analysis of basic indicators of food security in Serbia and neighbouring countries – strengths and weaknesses

The given analysis provides an opportunity to single out indicators that contribute to the improvement and stability of a food system and those that represent the major weaknesses. Among indicators that have score over 75, which are marked as “strengths” and contribute to the improvement of food security, is included an indicator that assesses the presence and quality of food safety net programmes. Another indicator with score

above 90 is the change in average food costs - which track the change of the costs of average market basket of food products (2010 = 100) (Table 5).

A sharp rise in costs of the average market basket of food products may indicate a decline in food affordability.⁵ In “strengths” are also included: indicator that measures the proportion of population under global poverty line, calculated as the percentage of the population living on less than \$ 3.20 per day, expressed in purchasing power parity (PPP for 2011); and indicator related to the increase of urban absorption capacity, which affects the ability to ensure food availability. Indicators related to food losses and food safety⁶ have high, but slightly lower values. This group of indicators also includes two that contribute to increased access to food (agricultural import tariffs and access to financing for farmers from the public sector). Lower agricultural tariffs may affect lower food import costs as well as food costs for consumers. Access to financing for farmers leads to increased farmers’ productivity and ability to provide better access to food. This is one of the indicators that most correlates with overall food security.

Table 5. Food security indicators (GFSI) that represent the strengths* in Serbia and selected countries in the region in 2019

	Indicator	Serbia	Bulgaria	Romania	Hungary	Greece	All countries average
1.5	Presence and quality of food safety net programmes	100.0	100.0	100.0	100.0	100.0	74.3
1.1	Change in average food cost	98.2	98.9	99.5	98.7	99.5	96.4
1.2	Proportion of population under global poverty line	92.7	98.0	93.0	99.3	98.1	83.5
2.7	Urban absorption capacity	91.4	92.1	98.6	95.1	85.0	82.0
3.5	Food safety	89.9	99.4	100.0	100.0	100.0	82.5
2.8	Food loss	89.4	-	95.3	93.5	87.1	84.9
1.4	Agricultural import tariffs	78.0	81.8	81.1	81.1	81.1	75.6
1.6	Access to financing for farmer	75.0	100.0	100.0	100.0	75.0	63.9

*”Strengths” are defined as all indicators with score above 75.0 (EIU Database, GFSI 2019)

Source: Authors’ processing and interpretation of data based on EIU Database and GFSI 2019

Indicators that contribute to Serbia’s food system and food security are also “strengths” in other countries included in the analysis. In this group of indicators with a score above 75.0, only Bulgaria has one indicator less (higher food losses), while other neighbouring countries have larger number of indicators that represent “strengths”. The same indicators

5 Over the last five years, relative food costs have been increasing worldwide, leading to a steady increase in the price of the average food basket (EIU, 2019).

6 These indicators include existence of an agency to ensure safety and health of food, access to cooling possibilities (cooling devices) and electricity presented as percentage of population with access to potable water, ability to store food safely etc.

that represent the advantages of food system in Serbia are also important in Hungary, but with higher scores, and in addition to them, indicator dietary diversity also has a high score (86.2). It is similar with Romania, whose food system, in addition to the listed “strengths” has other two indicators with a high score: micronutrient availability and sufficiency of supply. Among neighbouring countries, Greece has the largest number of indicators with a score over 75, which represent “strengths” and contribute to the improvement of food security (as many as 14). In addition to the above indicators of strengthening food security in this country, they also include dietary diversity, nutrition standards, volatility of agricultural production, micronutrient availability, political stability risk and protein quality.

The second group of indicators consists of those with score ranging from 25 to 75, which have medium impact on food security. Most of these indicators, whose impact on food security is characterized as medium, are the same for Serbia and the neighbouring countries.

Indicators with a medium impact on food security in Serbia can be significantly improved, and they include those related to food quality and safety: dietary diversity, micronutrient availability, protein quality and introduction of nutritional standards (aimed at improving quality and food safety of the population). The absence of recommendations and national nutrition guides, as well as plans and diet strategies (as special sub-indicators of improving food quality and safety) is evident. Opportunities for improvement are also linked to indicators that increase food availability, such as: average food supply in kcal per capita (still relatively low); improvement of agricultural infrastructure (improvement of appropriate warehouses, road, railway infrastructure, water and air transport infrastructure, irrigation infrastructure, etc), which can contribute to the improvement and elimination of oscillations and instability of agricultural production and increase food availability. Volatility of agricultural production⁷ can be caused by many factors, but it is most often the result of unpredictable events, such as unfavourable climate conditions, diseases, pests or price reduction. Stable agricultural production allows countries to better forecast food availability. This group of indicators also includes an indicator that measures political stability risk, which can reduce the availability of food, due to blockades of transport or reduction of food aid, etc.

The indicator that measures the presence of corruption in the country by assessing the risk of corruption has a score of 25 for Serbia, and is on the verge of indicators with biggest challenges, or weaknesses that must be overcome in order to improve food system and food security. Corruption can reduce food affordability through inefficient use of natural resources, or inefficiency in food distribution. The fight against corruption and its eradication also plays an important role in attracting foreign investors and securing greater investment in the agricultural sector. Masset (2011) consider that constitutive elements that contribute to fighting hunger are political will, anti-hunger policies and programs. In order to tackle corruption there must be a certain level of political will.

7 In the past eight years, Bulgaria is the country where this indicator has improved the most. In the period 2005-2009, the country had an index of the most unstable agricultural productivity among all analyzed countries, but with the trend of stabilization in every year.

Three types of corruption: individual, business and political are observed in the agricultural sector of Serbia. Land registry officials are reported as the third most corrupt public officials, with nearly 6% of citizens who had interactions with them, resulting in a bribe being paid. Transition in Serbia provided the opportunity for various forms of abuse and illegal behaviour through the privatization of public ownership. Privatization of Serbian agribusiness was not transparent, with frequent changes of legislation. During this process, in the past decade, more than 50.000 workers lost their jobs, which directly caused the increase of the hungry and the poor. This leads to conclusion that the level of corruption in Serbia is very high. After the democratic changes in 2000 Corruption Perceptions Index was 1.3, and in the meantime, this index increased almost three times to 3.5, but the fight against corruption did not produce significant results (Papić Brankov & Milovanović, 2015).

Two the most significant weaknesses of the food system in Serbia in 2019, measured by GFSI, are public expenditures on agricultural research and development (with a score of only 2.6) and gross domestic product per capita (US\$ PPP), with a score of 13.3 (Table 6).

Table 6. Overview of the GFSI indicators evaluated as “weaknesses” in Serbia and neighbouring countries in 2020

Indicator		Serbia	Bulgaria	Romania	Hungary	Greece	All countries average
2.2	Public expenditure on agricultural R&D	2.6	4.5	5.5	3.3	1.6	5.0
1.3	Gross domestic product per capita (US\$ PPP)	13.3	17.1	22.1	24.3	23.4	17.8

**“Challenges” or “weaknesses” are defined as any indicator score below 25.0 (EIU database, GFSI 2019)

Source: Authors’ processing and interpretation of data based on EIU database, GFSI 2019

Unlike indicators that are assessed as “strengths” and which contribute to strengthening the food systems of analyzed neighbouring countries, all the observed countries have the same indicators that represent their “weaknesses”. They are public expenditure on agricultural research and development and gross domestic product per capita. The exception is Romania, for which indicator (3.2) Nutritional standards is marked with a score 0.0, suggesting complete absence of any food standards in this country.

Public expenditure on research and development is crucial for developing the technologies and innovations necessary to increase agricultural productivity and reduce environmental impact. The Agricultural Orientation Index (IAO)⁸ estimates

8 The Agricultural Orientation Index (AIO) represents the agriculture share of government expenditure, divided by the agriculture share of GDP. AOI value greater than 1 means that the agricultural sector receives a higher share of government spending comparing to its contribution to the overall economy (EIU, 2019).

public investment in agriculture including “rural infrastructure, agricultural research and extension services, technology development, etc.” in order to enhance agricultural productive capacity (EIU, 2019). All participants in a food system – producers, logistics companies, retailers and consumers – should use innovations to identify completely new ways of producing, distributing and consuming food that will improve food security.⁹

Achieved GDP per capita (expressed in purchasing power parity in US\$) in Serbia is significantly lower than in the neighbouring countries. The level of GDP per capita in Bulgaria is 29% higher than the Serbian average, in Greece by 65%, in Romania by 70% and in Hungary by about 79% (Table 7). This indicator is one of the main reasons of Serbia’s lagging behind in terms of the achieved level of food security (measured by GFSI) in relation to the analyzed neighbouring countries.

Table 7. GDP per capita (US\$ PPP) in Serbia and neighbouring countries in 2019

	Serbia	Bulgaria	Romania	Hungary	Greece
GDP per capita	18,989.0	24,561.2	32,297.3	33,979.0	31,399.4
Index WB	100,0	129,3	170,1	178,9	165,3

Source: Authors’ processing and interpretation of data based on World Bank database

Growth of economic activities, increase of employment and reduction of poor population, as well as significantly higher public expenditures for research and development are crucial for innovations necessary to increase productivity in agriculture and reduce harmful effects on the environment, improving the food system and food security in Serbia.

Conclusion

In order to measure level of food security, various indicators have been defined. The Global Food Security Index (GFSI) is an indicator that measures the level of food security of individual countries and allows comparison between them. The latest GFSI data for 2019 show that Serbia is the worst ranked among the chosen neighbouring countries and is placed on 59th place, while Greece is the best positioned (31st position out of 113 countries).

The comparative analysis of individual dimensions of food security (affordability, availability, food quality and safety, and natural resources and resistance to adverse climate and other influences) indicates that all neighbouring countries have achieved higher score for each of these dimensions of food security. This confirms the initial hypothesis that, in terms of food security, Serbia lags behind the selected neighbouring countries. Serbia is ranked the worst according to the second component of GFSI – Availability, which can be explained by the factors involved in its calculation, primarily small allocations for agricultural research and development and significant oscillations in agricultural production.

⁹ UN data show that spending on agriculture has decreased compared to the agriculture contribution to GDP since the early 2000s (EIU, 2019).

The analysis of individual indicators of GFSD, i.e. food security performed at the level of the Republic of Serbia and neighbouring countries shows that, most often, same indicators (with values above 75.0) contribute to the improvement of food system and food security of Serbia and all neighbouring countries.

Two indicators can be singled out as the most significant weaknesses of Serbian food system in 2019: public expenditure on agricultural research and development and gross domestic product per capita expressed in purchasing power parity. These indicators are also the worst indicators of food security in all analyzed neighbouring countries.

Faster economic development of the country, higher public expenditures on agricultural research and development and innovation necessary to increase agricultural productivity and reduce harmful effects on the environment can significantly improve the food system, quality and food safety in Serbia. Additionally, recommendations and national nutrition guides, as well as plans and food strategies can also contribute to the improvement of Serbian position comparing to neighbouring countries.

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Conflict of interests

The authors declare no conflict of interest.

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