

FOOD SECURITY OF THE EUROPEAN UNION AND THE INFLUENCE OF COVID-19

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Abstract

Food security is one of the basic elements of human security that can only be ensured through a sustainable development of society. On the other hand, food security is an important element of global and national security, and is ensured at European level through the common defence and security policies implemented by the Member States. And this food security, which for many countries in the world is already a difficult problem to manage, was affected in 2019 by the COVID-19 pandemic, which caused the whole world to face an unprecedented crisis and which, although it affected the whole world, had an even greater effect on the poor populations that suffered even more, amid an increase in hunger anyway for four consecutive years, that is in the period 2017-2020. In this paper we aimed to analyze the food security situation in European Union countries and how the Covid-19 crisis has affected it. Based on the data provided by international databases, the information was processed, analyzed so that conclusions can be drawn that highlighted the fact that food security is one of the issues of concern to decision makers internationally, but which is ensured for European Union countries this is due to the developed agricultural sector and the productions that manage to ensure the food needs of the European population. The analyzed indicators followed both the agricultural areas and the GDP value, but also the value of the imports and exports of agri-food products at the level of the member countries of the European Union.

Key words: food security, food crisis, Covid-19, poverty

INTRODUCTION

Globalization is a phenomenon that we are experiencing and which, in addition to its many benefits, has been accompanied by many disadvantages that have been presented in numerous studies over time and which show that many crises such as food or energy are partially the result of policies which in this context of globalization are much less flexible [15], [5].

In the literature, food security has had different approaches, being defined as: a way to ensure access to healthy food for all mankind; way to ensure the necessary food; the right of everyone to eat and eat as healthy as possible; way to ensure social, economic stability and national security [16].

Therefore, the issue of food security and how the world's population will be able to cope with hunger has been addressed over time in

numerous papers. Thus in 1968, Paul Ehrlich shows that humanity has lost the ability to provide food for the world's population as a result of population growth. Although the world's population increased by 50% after 1961, the reality showed that agricultural production tripled, and among developing countries production increased fourfold due to the doubling of the population [14]. However, the share of people on the brink of poverty fell from 50% in 1950 to about 9% in 2020 amid the Covid-19 crisis, given that the percentage of extreme poverty in that year was expected to be 7.9%. The target set for 2030 is to reduce poverty to 7% [18].

Lomborg Bjørn points out in one of his articles that poverty and hunger depend less on climate change and more on economic, social or political aspects, because even if environmental change were to be stopped, this would have little influence reducing extreme

poverty. The application of nutrition programs, the use of vaccination programs, disease prevention, extension of education are considered effective measures that can be applied to vulnerable communities around the world [14].

Another cause of the food crisis is the increase in prices, and the reason for their increase is actually determined by several factors, which never act separately, but are interconnected and have the effect of threatening food security. First of all, the increase of the population will require the increase of the productions that will be able to cover the necessary food. Studies show that the world's population will reach from about 7.7 billion today to 10.9 billion people in 2100 [4]. And some measures, such as the decision to use agricultural land for energy crops, as a result of increasing fuel demand, have led to a decrease in areas for agricultural crops, which has continued to increase the prices of agricultural products. At the same time, agricultural production is influenced by climate change, which is the result of global warming. Another factor is the increase in income for a part of the world's population, which makes the need for food increase and with it the need for cultivated areas. It must be acknowledged that the policies applied in the agricultural field, the subsidy system of agricultural products have contributed to price distortions, and regarding food products, government policies influence both supply and demand.

On the other hand, the food crisis is correlated with the energy crisis, and the price of oil in turn influences food security. In terms of supply in the agricultural sector, Western governments have a small margin for action in the face of high consumer demand in the economy, and change can only be achieved through innovation and the application of new technologies that require high investment that poor countries do not have access.

But we are all responsible for this situation, because without thinking about the consequences, we have contributed to depleting resources and ensuring the comfort of the present generation, realizing late the

need not to compromise future generations the possibility of ensuring their own needs [6].

Crises can have multiple causes, not only of an economic nature, but also of a medical nature, such as the current Covid-19 crisis, which has certainly influenced food security. This is the reason why in this paper we aimed to analyze in addition to the issue of food security and how it was managed in 2012-2019 and influenced by various factors. Or one of these factors is the Covid-19 pandemic. We also tried to identify solutions that could contribute to improving the current situation, realizing that the causes of food crises and food security instability are multiple, and better management will have favorable effects globally.

Food security, both micro and macro, will have to be considered in relation to certain parameters of food security, given that new categories of powers have emerged on the global policy scene that design both commercial and economic policies that capture certain food markets and which are represented by the food powers, whose importance is undeniable [2].

MATERIALS AND METHODS

In order to measure food security, different indicators have been taken into account that allow comparisons to be made between countries or regions, and which combined can provide an image that is intended to be as clear as possible regarding this concept. One of these is the Global Food Security Index, which tracks the four dimensions of food security, namely: accessibility; availability; quality and safety; natural resources and resilience [3]. At the level of 2019, this index was calculated for 107 countries of the world, starting from the evaluation of 132 countries. For 25 countries the data were not sufficient to determine the rank, being removed from the sample.

Another indicator is the Global Hunger Index (GHI), which was calculated by the International Food Policy Research Institute and uses four indicators: "the percentage of the undernourished population (UNHCR), the percentage of children under 5 years old who

suffer from stunting (low height-for-age), the percentage of children under 5 years old who suffer from wasting (low weight-for-height) (CWA) and the percentage of children who die before the age of five (child mortality) (CM) [12]. Other indices for measuring food security are: the index of health and hunger, the index of hunger and climate vulnerability, the Composite I-distance Indicator", etc., each of them being calculated according to different aggregate indicators, but all following the quantification of food security.

In this paper we aim to analyze the evolution of the Global Food Security Index at the level of EU member states for the period 2012-2019, as well as part of the aggregate indicators. The index can take values between 0-100, 0 being the value assigned to the countries that have the lowest gross values, and 100 for the countries with the highest gross values.

From 2017 in determining the indicator are taken into account elements related to the natural resource adjustment factor and resistivity, the calculation formula being:

$$Score = x * (1 - z) + [x * (y / 100) * z], [13]$$

where:

x - initial score;

y - the score for the fourth component

z - adjustment factor.

The adjustment factor takes the values: 0; 0.5; 1. The default setting of the adjustment factor, according to EIU is 0.25, that is, 25% [17].

The calculation of accessibility to food is made in relation to 6 indicators, namely: food consumption per household, the percentage of the population below the global poverty line; GDP/capita, agricultural import tariffs, the presence of food security programs and farmers' access to financing programs.

Availability is determined on the basis of eight indicators, namely: adequacy of supply, public expenditure on agricultural research and development, agricultural infrastructure, the size of agricultural production volatility, risk to political stability, corruption, food waste and urban absorption capacity.

Measuring food quality and safety uses five indicators, namely: diet diversity; nutrition

standards, protein quality, micronutrient availability and food safety.

The evolution of the indicators for the analyzed interval was determined using the Fixed Base Index (IFB):

$$IFB = (x_n / x_1) * 100, [1]$$

where:

x = analyzed variable,

n = 1, 2, 3 ... n, the years that are part of the chronological series.

RESULTS AND DISCUSSIONS

The index that reflects global food security shows an improvement in the situation from one year to the next, although food insecurity and hunger still affect a large part of the globe.

Starting from the methodology presented, in this paper we aimed to analyze how the degree of food security has evolved in European countries, given that Europe is one of the regions where the risks of food security are low compared to other areas of the world. These comparisons will be the subject of further study.

At the EU-28 level, and since last year the EU-27, there are 8 countries that are not in the annual rankings of the Global Food Security Index (Table 1). For the other 20 states, the analysis was performed for the period 2012-2019.

We also followed some of the aggregate indicators that influence food security and are the basis for determining this index, given that food security has two strongly interrelated dimensions, one quantitative and one qualitative.

The quantitative dimension refers to the possibility of ensuring sufficient quantities of food to meet the physiological needs of the reference population, and the qualitative dimension refers to the properties of food consumed by the reference population and not to affect or endanger its health. Food insecurity, however, also refers to the categories of people who cannot afford a sufficient amount of quality food that can ensure their health and at the same time active

participation in society. Given the importance of food security, we believe that a collapse of

this sector may result in the collapse of the entire security sector worldwide.

Table 1. Evolution of the Global Food Security Index in E.U. countries

Country	2012	2013	2014	2015	2016	2017	2018	2019
Austria	85.6	83.4	85.5	85.1	79.3	85.1	81.4	81.7
Belgium	82.2	82.4	82.0	79.5	77.4	79.5	80.7	80.7
Bulgaria	57.6	55.9	59.6	61.0	60.6	61.0	65.7	66.2
Cyprus	-	-	-	-	-	-	-	-
Croatia	-	-	-	-	-	-	-	-
Czech Republic	73.5	72.2	74.6	74.9	73.9	74.9	72.7	73.1
Denmark	88.1	81.8	83.3	82.6	80.0	82.6	80.4	81.0
Estonia	-	-	-	-	-	-	-	-
Finland	83.1	81.4	79.9	79.8	78.9	79.9	82.9	82.9
France	86.8	83.7	83.4	83.8	82.5	83.8	80.4	80.4
Germany	83.0	81.7	83.7	83.9	82.5	83.9	80.4	81.5
Greece	79.9	70.7	74.3	73.5	71.5	73.5	72.6	73.4
Hungary	70.7	69.0	71.2	71.4	69.3	71.4	72.6	72.7
Ireland	-	81.7	84.0	85.4	84.4	85.4	83.4	84.0
Italy	79.1	74.6	77.6	77.0	75.9	77.0	75.2	75.8
Latvia	-	-	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-	-	-
Luxemburg	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-
Netherlands	86.7	83.2	84.4	85.0	82.6	85.0	81.5	82
Poland	72.5	69.9	72.7	74.3	72.4	74.3	74.9	75.6
Portugal	80.8	76.1	80.3	80.5	80.0	80.5	77.7	77.8
Romania	62.5	65.0	61.3	63.3	65.5	63.3	70.4	70.2
Slovakia	68.8	63.2	69.8	70.7	67.7	70.7	66.7	68.3
Slovenia	-	-	-	-	-	-	-	-
Spain	81.2	77.5	79.8	78.9	77.7	78.9	74.9	75.5
Sweden	80.2	80.8	82.4	82.9	81.3	82.9	82.5	82.7
United Kingdom	79.0	77.3	81.6	81.6	81.9	81.6	79.2	79.1

Source: own processing [12].

The data presented in Table 1 show that at the level of the European Union all countries are in the first half of the ranking for the entire period analyzed, which shows that at the Union level there are no serious problems raised by food security.

The data in Table 2 show how the components participate in determining the global food security index for European Union countries in 2019. Values over 75 points reflect favorable aspects, so we find that there are few countries with a global index below this value. Among these countries are Bulgaria with the lowest score

(66.2 points), followed by Slovakia (68.3 points), Romania (70.2 points), Hungary (72.7 points) and Greece (73.4 points).

If among Bulgaria, Hungary and Greece, the decline in the index was influenced first by Availability and then by Quality and safety, in Slovakia and Romania Quality and safety had the greatest influence on the low value of the global food security index. Regarding Romania, it is found that the sufficiency of the offer has a score of 79.3 points. It measures the availability of food whose values are expressed in kcal/head/day, and also the level of customs duties on agricultural imports.

There are also indicators that register moderate values (agricultural infrastructure and the share of food expenditures in the total household expenditures).

Table 2. The global food security index in the E.U. in 2019

Country	Total Score	Accessability	Availability	Quality and Safety
Austria	81.7	85.4	78.6	81.1
Belgium	80.7	84.4	76.2	83.9
Bulgaria	66.2	79.0	54.2	66.8
Cyprus	-	-	-	-
Croatia	-	-	-	-
Czech Republic	73.1	82.6	66.3	68.1
Denmark	81.0	85.4	74.8	87.2
Estonia	-	-	-	-
Finland	82.9	84.1	78.6	91.8
France	80.4	83.8	74.8	87.1
Germany	81.5	84.9	79.1	79.8
Greece	73.4	77.8	64.9	86.0
Hungary	72.7	80.8	66.1	70.5
Ireland	84.0	90.5	76.8	87.7
Italy	75.8	82.5	68.3	79.7
Latvia	-	-	-	-
Lithuania	-	-	-	-
Luxemburg	-	-	-	-
Malta	-	-	-	-
Netherlands	82.0	85.6	76.2	88.9
Poland	75.6	81.1	69.3	79.5
Portugal	77.8	81.3	70.9	88.0
Romania	70.2	79.3	64.3	64.1
Slovakia	68.3	78.6	62.1	59.4
Slovenia	-	-	-	-
Spain	75.5	82.3	65.9	84.7
Sweden	82.7	85.0	78.1	89.4
United Kingdom	79.1	83.6	74.4	80.9

Source: own processing [12].

On January 1, 2020, the population of the 27 states of the European Union was approximately 447.7 million inhabitants, registering a decrease of almost 13% compared to the previous year (513.5). This was also due to the United Kingdom's exit from the European Union, but also to net migration. These figures will continue to decline due to deaths caused by the Covid-19 pandemic.

Through the GDP/capita expressed in purchasing power (PPS) the living standard of the population is assessed.

The largest shares in the EU are owned by Germany (18%), France (15%), Italy (14%) and Spain (10%). At the opposite pole are countries such as Luxembourg and Malta with 0.1% each, Cyprus (0.2%), Estonia (0.3%) and Latvia (0.4%).

However, it is found that in terms of GDP, Luxembourg is in first place in the E.U. with a value of 261 thousand euros/capita, followed by the Netherlands (130 thousand euros/capita) and Sweden (120 thousand euros/capita), while Bulgaria has a GDP of 51 thousand euros/capita inhabitant, and Romania 66 thousand euro/capita.

Table 3. Key indicators in determining the Global Food Security Index in 2019

Country	Population (million inhabitants)	GDP/capita (Euro Thousand) (PPE)	Export of agro- products (Euro Million)	Import of agro- products (Euro Million)
Austria	8,901	128	13,046	13,121
Belgium	11,549	118	40,961	33,833
Bulgaria	6,951	51	4,838	3,673
Cyprus	0,888	91	417	1,142
Croatia	4,058	64	2,087	3,306
Czech Republic	10,693	92	7,612	9,533
Denmark	5,822	129	16,160	10,622
Estonia	1,328	82	1,174	1,507
Finland	5,525	112	1,996	5,198
France	67,098	104	65,690	52,436
Germany	83,166	123	76,394	91,195
Greece	10,709	67	6,039	6,832
Hungary	9,769	71	9,494	6,365
Ireland	4,963	191	13,604	9,272
Italy	60,244	97	44,757	40,314
Latvia	1,907	69	2,886	2,835
Lithuania	2,794	82	4,934	3,694
Luxemburg	0,626	261	1,200	2,390
Malta	0,514	99	128	575
Netherlands	17,407	130	93,652	63,111
Poland	37,958	71	29,573	19,332
Portugal	10,925	78	6,322	9,308
Romania	19,318	66	7,196	8,379
Slovakia	5,457	71	2,907	4,735
Slovenia	2,095	87	2,156	2,980
Spain	47,330	91	48,985	31,508
Sweden	4,385	120	5,677	11,855

Source: own processing [10].

Analyzing the situation of imports and exports of agricultural products in the European Union, we find that the highest value of imports is recorded in the Netherlands, with over 93 billion Euros, Germany with over 67 billion Euros exports and France with about 66 billion Euros. In terms of exports, the highest value is recorded by Germany with over 91 billion Euros, followed by the Netherlands with 63 billion Euros and Italy with 40 billion Euros exports.

The surplus of the trade balance with agricultural products has high values in countries such as the Netherlands (+30,541 million Euros), Spain (+17,477 million Euros), France (13,254 million Euros).

There are also countries with a moderate surplus such as Belgium (+7.128 million Euros) or Bulgaria (+1.165 million Euros).

But there are also countries such as Germany with a deficit of 14.801 million Euros or Finland with a deficit of 3.302 million Euros. Romania also registers a deficit of the trade balance with agricultural products of 1.183 million Euros.

At European Union level, sufficient food security is due to its agricultural potential. At the same time, however, the countries of the European Union also contribute to ensuring food security in other areas of the world through food exports, both raw and processed foods.

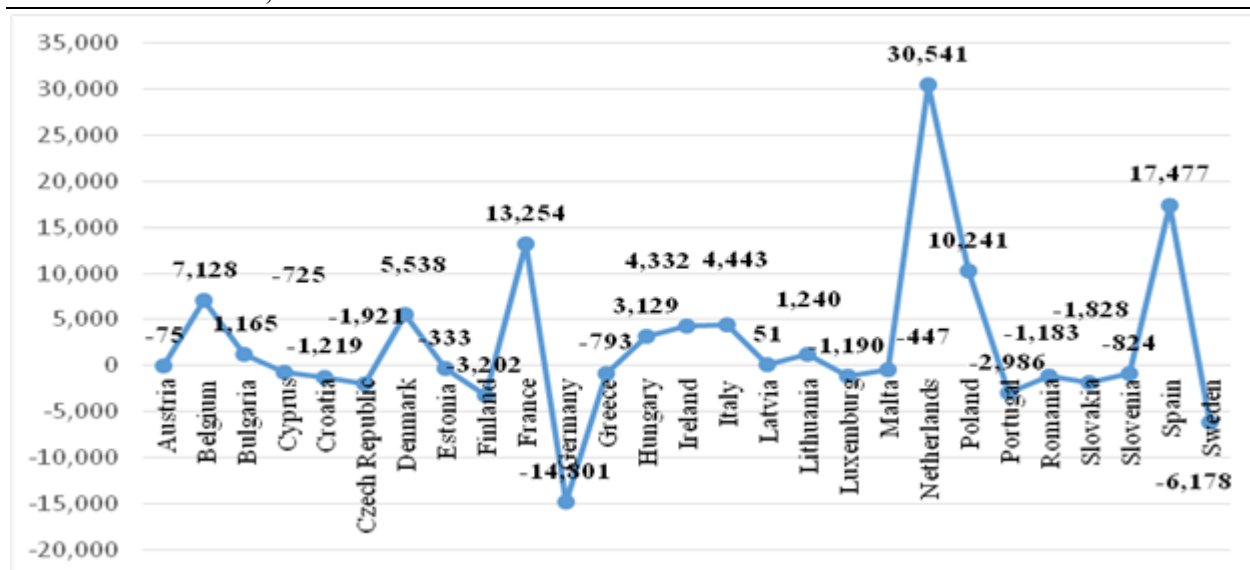


Fig. 1. Trade balance of agricultural products in the European Union countries, in 2019
 Source: own processing [7].



Fig. 2. The situation of exports and imports in the European Union, in the period 2015-2019
 Source: own processing [8].

Since 2010, the European Union has become a net exporter and has maintained this position ever since. In 2019, the value of food trade in the Union registered the highest value, namely 270.5 billion Euros, increasing compared to 2018 by 6.4% when it had a value of 254 billion Euros. Increases were recorded both in terms of exports (151 billion Euros) and in terms of imports (119 billion Euros). The evolution of food trade for the last five years is shown in Figure 2, resulting in the European Union being the largest exporter of food in the world, and at the same time occupies the second position in the world in

terms of imports. This is due to the effects of the CAP which supports competitiveness and innovation, the fact that farmers are supported and encouraged to export, but also to quality products. Besides the value of the sold production, these activities are generating jobs both for the primary activities and in the processing sectors.

The value of exports of agricultural products increased by 7.6% in 2019 compared to the previous year and by 14.3% compared to 2015. By product categories it is found that the value of "agricultural food and feed products" increased by 2% in 2016 compared

to basic, by 6% in 2017 and by 5% in 2018. In 2019, the increase was almost 14%. The value of "food preparations and beverages" had the

largest increase. In 2019, compared to 2015, it was 20%, and compared to 2018 almost 7%.

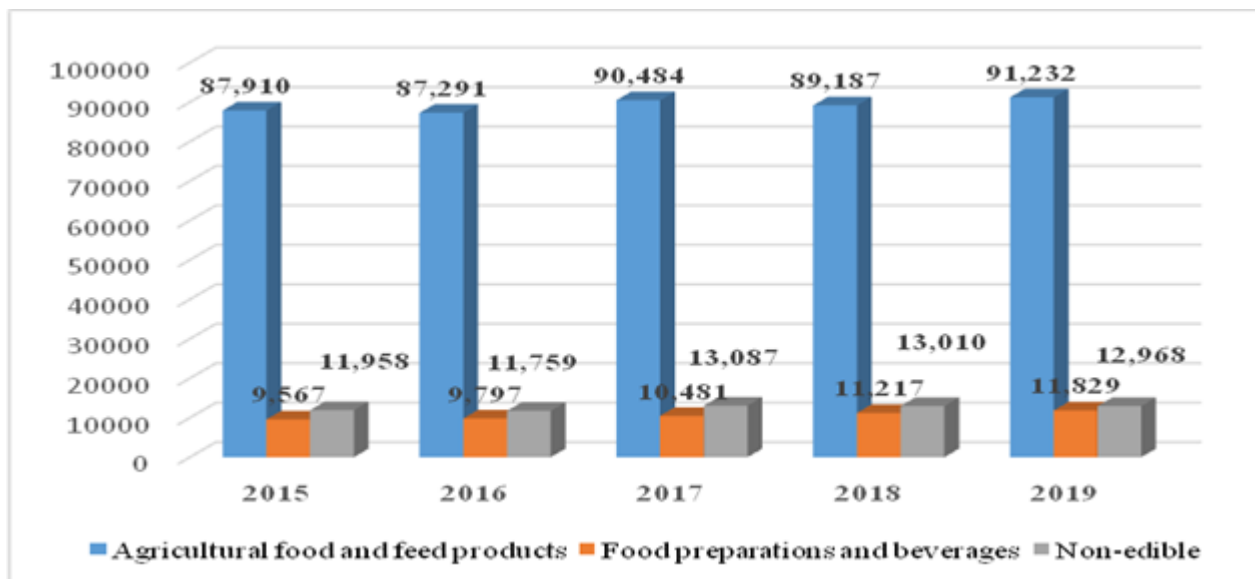


Fig. 4. Evolution of Agri-food exports in the European Union, by product categories
 Source: own processing [8].

The value of imports had a lower growth rate than that of exports. Thus, in 2019 the increases compared to 2015 were 4% for

agricultural food and feed products, 24% for food preparations and beverages and 8% for non-edible.

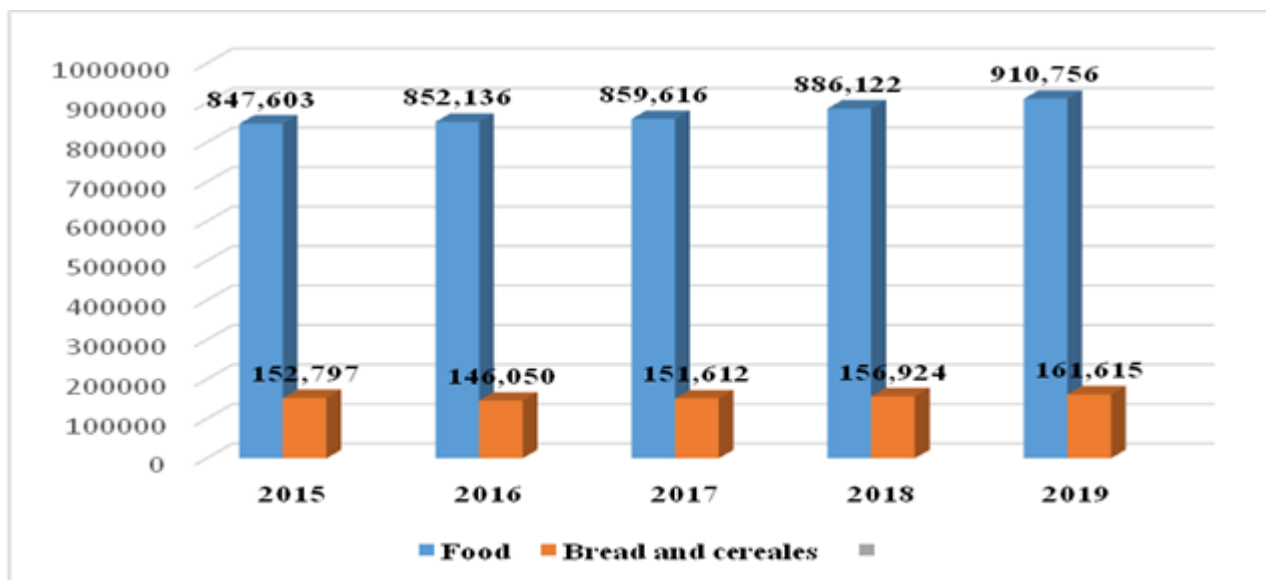


Fig. 5. Evolution of consumer price indices, by aggregate, in the E.U.
 Source: own processing [11].

Price level indices, at purchasing power parity (PPP), for food, and bread and cereals highlighted the increase in purchasing power for food products by 7% in 2019 compared to 2015 and by 6% for bread and bakery products. In terms of bread and bakery

products, the average price in the U.S. it was twice as high as in Romania, which is the country with the lowest price for bread. In Denmark (151), the country with the highest price for bread and bakery products, the price is three times higher than in Romania (53).

The analysis shows that Europe is not one of the areas whose food security is threatened, given that globally, for 2019, 55 countries have been identified that have faced problems related to food security as a result of chronic problems related to poverty, military conflicts, drought or extreme phenomena [12]. Of the total 690 million inhabitants, however, about 19% had the problem of providing food as a result of the Covid-19 pandemic.

At the level of the European Union, however, measures have been taken to protect disadvantaged groups that have provided assistance, but also food, clothing or essential items for personal use and that supplement social inclusion measures to help people out of poverty.

Measures have also been taken to support agriculture and the food sectors to provide food. These measures consisted of aid for private storage in the dairy sector and in the meat sector; greater flexibility of market support measures; granting temporary E.U. derogations from competition for certain product categories (potatoes, milk, or flowers) [9].

Measures have also been taken to ensure the mobility of seasonal workers to the Member States of the European Union where there have been critical situations related to the agricultural sector or the functioning of the single market which have led to the creation of special green lanes at the border agri-food products. And yet, globally there are concerns about ensuring food security, among its causes being: the global collapse in demand for agri-food products, declining revenues, a significant part of them from remittances, reduced market access for both sellers, as well as of the buyers, etc.

CONCLUSIONS

The issue of food security is a complex one, and its management requires a correlated effort globally. Access to food is limited on the one hand by income disparities, and in terms of food use the problems appear both in the situation of under-production and in the situation of over-production, so ensuring food security requires a unified approach to food

systems. A correct correlation of demand and supply given that the challenges related to demand are nutrition and health, and in terms of supply are related to agricultural production.

In conclusion, we consider that the agricultural field represented, but will continue to represent an area of strategic importance and that will be directly related to national security, given that it will be necessary to ensure a basic consumption for its own population.

Under the conditions of ensuring an equitable distribution of food products, both the global food risk and the environmental risks would be reduced. Thus, the controlled exploitation of agricultural land or the reduction of economic migration could be measures that could contribute to ensuring food security.

Although food security is an important issue globally in European Union countries, this risk is low and affects only certain vulnerable social groups.

The countries of the European Union are in the first half of the world ranking in terms of ensuring the Global Food Security Index, this being influenced by the production capacity of the agricultural sector.

Although the food sector has faced some difficulties related to the supply of raw materials, labor or logistics, at the European Union level this sector has remained resistant to the Covid crisis - 19 succeeding in providing food for its citizens.

REFERENCES

- [1]Anghelache, C., Manole, A., 2014, Dynamic/Chronological (Time) Series. Statistical Review [Seriile dinamice/cronologice (de timp), Revista de statistica], No. 2, 2014, https://www.revistadestatistica.ro/wp-content/uploads/2014/02/RRS_10_2012_A5_ro.pdf, Accessed on 21.12.2020.
- [2]Antonescu, M. V., 2019, Food security in the context of global food crisis and the rise of "food powers" - some considerations, Romanian military thinking (Securitatea alimentară în contextul unei crize alimentare globale și al ascensiunii „puterilor alimentare” - câteva considerații, Gandirea militara romaneasca), <https://gmr.mapn.ro/app/webroot/fileslib/upload/files/arhiva%20GMR/2019%20gmr/Conferinta%20GMR%20>

2019/GMR_CONF%20ro_Antonescu%20Securitatea%20alimentara.pdf, Accessed on Dec.21, 2020.

[3]Asih, N. D., Klasen, S., 2017, Improving food security? Setting indicators and observing change of rural household in Central Sulawesi, Regular Research Article, Forest and Society, Vol. 1(2),154-161, <https://media.neliti.com/media/publications/197471>, Accessed on Dec.21, 2020.

[4]Cilluffo, A., Ruiz, N., G., 2019, World's population is projected to nearly stop growing by the end of the century, Fact Tanc, <https://www.pewresearch.org/fact-tank/>, Accessed on Dec. 19, 2020.

[5]Dorobantu, D.M., Marcuta, A., Marcuta, L., 2019, Globalization and tourism. Case study - Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 19(3), 197-202.

[6]European Commission, 2016, The EU's vision for sustainable development, https://ec.europa.eu/info/strategy/international-strategies/sustainable-development-goals/eu-approach-sustainable-development_ro, Accessed on Dec. 20, 2020.

[7]European Commission, 2019, Agri-food trade 2018, https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/news/documents/agri-food-trade-2018_en.pdf, Accessed on Dec. 20, 2020.

[8]European Commission, 2019, Agri-food trade statistical factsheet, https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/agrifood-extra-eu27_en.pdf, Accessed on Dec. 20, 2020.

[9]European Commission, 2020, Coronavirus: Emergency response to support the agriculture and food sectors, https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/factsheet-covid19-agriculture-food-sectors_en.pdf, Accessed on Dec. 22, 2020.

[10]European Commission, 2020, Living in EU, https://europa.eu/european-union/about-eu/figures/living_en, Accessed on Dec. 20, 2020.

[11]Eurostat, 2020, Purchasing power parities (PPPs), price level indices and real expenditures for ESA 2010 aggregates, https://ec.europa.eu/eurostat/databrowser/view/prc_ppp_ind/default/table?lang=en, Accessed on Dec. 21, 2020.

[12]Global Network Against Food Crises, 2020, global Report on food crises, https://www.fsinplatform.org/sites/default/files/resources/files/GRFC2020_September%20Update_0.pdf, Accessed on Dec. 22, 2020.

[13]Leroy, J.L., Ruel, M., Frongill, E.A., Harris, J., Ballard, T.J., 2015, Measuring the Food Access Dimension of Food Security: A Critical Review and Mapping of Indicators, Food and Nutrition Bulletin, Vol. 36(2), pp. 167-195, DOI: 10.1177/0379572115587274, <https://journals.sagepub.com/doi/pdf/10.1177/0379572115587274>, Accessed on Dec. 19, 2020.

[14]Lomborg, B., 2011, Food security, germs already exists (Securitatea alimentara: germenii deja exista), Nato Review,

https://www.nato.int/docu/review/2011/Climate-Action/Food_Security_Solutions/RO/index.htm, Accessed on Dec. 20, 2020.

[15]Mărcuță, A., Simionescu, A., Tindecu, C., Mărcuță L., 2018, Relationship between sustainable development and public health. Case study Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 18(3), 251-259.

[16]Marcuta, L., Marcuta, A., 2013, Role of supply chain management in increasing the competitiveness of companies in a global context, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 13(1), 227-229.

[17]The Economist Intelligence Unit, 2018, Global Food Security Index 2020. Building Resilience In The Face Of Rising Food-Security Risks, <https://foodsecurityindex.eiu.com>, Accessed on Dec. 12, 2020.

[18]The World Bank, 2019, Poverty headcount ratio at national poverty lines (% of population), <https://data.worldbank.org/indicator/SI.POV.NAHC>, Accessed on Dec.12, 2020.