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IMPORT AND EXPORT OF WHEAT, SUNFLOWER AND POTATO IN THE CONTEXT OF ENSURING FOOD SECURITY

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Abstract

Romania plays an important role in the whole of EU agriculture, being a major player in the cereals, oilseeds and vegetables market. In 2020, Romania ranked first in sunflower production, fifth in wheat production and seventh in potato production. The research aims to determine the distribution of import and export values for wheat, potato and sunflower crops, sales prices and the security of the position of the crops studied in Romania. By calculating the Gini coefficient, the degree of concentration for wheat import showed a high value, while for wheat export it showed a low value. For potato cultivation, the values of imports in 2020 were evenly distributed due to the lower concentration of the coefficient, while for exports, the degree of concentration was higher. For imports and exports, the Gini coefficient shows an even concentration range.

Key words: *Gini coefficient, food security, Romania*

INTRODUCTION

The European Union is a major producer and trader of cereals around the world. In 2016, 57 million hectares were cultivated and 301.3 million tonnes were harvested, 2.6% more than in 2000-2015, while the area decreased by 7.5% [12].

In Romania, agriculture and cereal production are important sectors that have ensured economic growth and population stability in recent years. With its biological function, it is a major source for economic activity and labour use. The Romanian authorities support cereal production, mainly after EU accession, by launching a series of instruments aimed at supporting local agricultural producers [15].

Cereal cultivation is very important for Romania, contributing by an estimated 5-6% to GDP. The competitiveness of the sector can be ensured by paying special attention to infrastructure, grain storage and processing centres and even attracting foreign and local investors to obtain higher quality products [14].

Romania is also an important player on the oilseed market at global and EU level, thanks to the country's position, climate and fertile soil, which favour plant growth. The European Union also supports the cultivation of oilseeds to help the bio-fuel industry and oilc onsumption [13].

The area cultivated with potatoes ranks Romania among the top EU countries, while the yield is among the lowest in the EU-27, the contribution at EU level in 2009 was 4.38%. This can be put down to the growing requirements of potatoes, which lead to high costs for farmers to maintain competitiveness and profitability [17].

The communist period favoured the development of cities, and after this period there was the retrocession of small and very large land, which led to the emergence of small and medium-sized farms and the emergence of subsistence farming. These farms showed and still show low productivity caused by lack of mechanization [6].

Food insecurity in the medium and long term is one of the world's main concerns, taking into account climate change, scarcity of land,

water and other agricultural resources, population growth, increasing fragility of markets and trade, and poverty in many areas, especially rural areas [1].

Food expenditure as a share of total consumer expenditure is a key indicator of a household's food security as it reflects access to food. This metric has been declining in Romania over the last two decades as the general standard of living increases [2], [3].

Romanian agricultural production is highly volatile and production levels are high and dependent on climate and other natural factors. This has negative effects in building food security through domestic production, where domestic farmers do not meet demand [9], [10].

To maintain food security in the long term, Romania should aim to increase agricultural potential through investments and favorabl epolicies. The instability of agricultural production is due to weather factors and improvement methods, and the main sources of household income are cash income and self-consumption [8].

The aim of the paper is to identify the dispersion of imports and exports in value for wheat, potato and sunflower crops, to identify the selling price and the position occupied by Romania at EU level for the crops studied in the context of ensuring food security.

MATERIALS AND METHODS

The Gini coefficient was created and used by the statistician Corrado Gini in 1912. The index measures the dispersion of statistical data, mainly used to describe the disproportionality of income or wealth distribution. It is represented as a percentage and is defined by the value ratio between 0 and 1, where 0 represents perfect equality and 1 represents perfect inequality.

$$G = \frac{\sum_i \sum_j |x_i - x_j|}{2 \sum_i \sum_j x_i}$$

The research analysed statistical data provided by Eurostat and TradeMap, on the basis of which the following statistical indicators were calculated:

- ***coefficient of variation*** $v = \frac{\sigma}{x} 100$, where:
  - σ = mean deviation;
  - x = average level of a variable;
- ***growth rate*** $\bar{R} = (\bar{I}\, x\, 100) - 100$, where:
  - $\bar{I}$ = overallaveragegrowth rate.

RESULTS AND DISCUSSIONS

In 2020, Romania recorded an area of 4.27 thousand hectares, an increase by 53.6% compared to the area recorded in 2015 (2.78 thousand hectares).

The average production of durum wheat in 2015 was 20.31 tonnes/ha, reaching an average production of 20.37 tonnes/ha in 2021, an increase by 16.67%. Romania also showed an increase in total durum wheat production by more than 35% in 2020 (10.68 thousand tonnes) compared to the total production recorded in 2015 (7.91 thousand tonnes).

Romania cultivated potatoes in an area of 174 thousand hectares in 2020, showing a decrease by 10.75% compared to the area cultivated in 2015 (196 thousand acres).

In terms of yield, in 2020 its levl was 15.42 tons/hectare, an increase by 11.98% compared to 2015 (13.77 tons/ha).

Total potato production shows a decrease by 0.04% in 2020 (2,698.50 thousand tons) compared to 2015 (2,699.68 thousand tons).

Regrading sunflower, Romania cultivated in 2020 an area of 1,011.53 thousand hectares, reaching in 2020 an area of 1,194.32 thousand hectares, showing an increase by 18%.

The average sunflower yield decreased by 12.28% in 2020 (2.5 tons/ha), compared to the yield recorded in 2015 (2.85 tons/ha), while the total sunflower output increased by 23% in 2020 (2,198.67 thousand tons), compared to the level recorded in 2015 (1,785.77 tons) (Table 1).

Table 1. Main technical indicators for the main durum wheat, sunflower and potato crops

Country	*Indicator*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2020/2015*
Durum wheat	Area (thousand ha)	2.78	7.02	4.78	5.63	5.73	4.27	53.60
	Average production (t/ha)	20,031	5,151	5,463	11,642	12,250	23,371	16.67
	Total production (thousand tonnes)	7.91	24.65	20.58	20.76	16.53	10.68	35.02
Potato	Area (thousand ha)	196.07	186.24	171.39	173.3	174.12	174.99	-10.75
	Average production (t/ha)	13.77	14.44	18.19	17.44	15.09	15.42	11.98
	Total production (thousand tonnes)	2,699.68	2,689.73	3,116.91	3,022.76	2,626.79	2,698.50	-0.04
Sunflowerseed	Area (thousand ha)	1,011.53	1,039.82	998.42	1,006.99	1,282.70	1,194.32	18.07
	Average production (t/ha)	2.85	3.51	4.3	3.69	2.89	2.5	-12.28
	Total production (thousand tonnes)	1,785.77	2,032.34	2,912.74	3,062.69	3,569.15	2,198.67	23.12

Source: Own processing based on EUROSTAT data [4].

At the E.U. level, Germany produced the largest quantity of potatoes (11,715.1 thousand tonnes of potatoes), followed by countries such as Poland (9,055.9 thousand tonnes), France (8,670.9 thousand tonnes), the Netherlands (7,020.1 thousand tonnes), with Romania ranking the 7th with a production of 2,683 thousand tonnes (Figure 1).

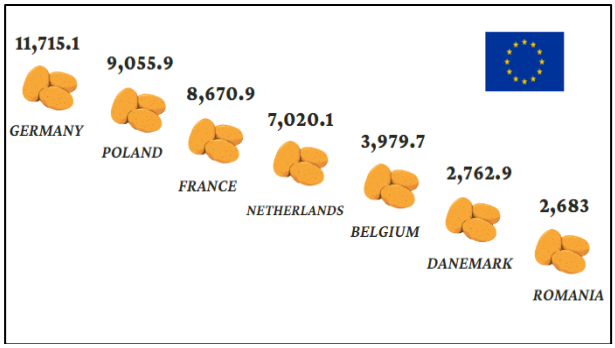

Fig. 1. Main potato producing countries in the European Union in 2020 (thousand tonnes)
Source: FAO data [5].

In terms of wheat production in 2020, Romania ranked the fifth with a production of 6,754 thousand tons, out distanced by countries such as France with a production of 30,144 thousand tons, Germany with 22,172 thousand tons, Poland with 12,433 thousand tons. Romania is an important wheat producer, producing enough to ensure thecountry's food security (Figure 2).

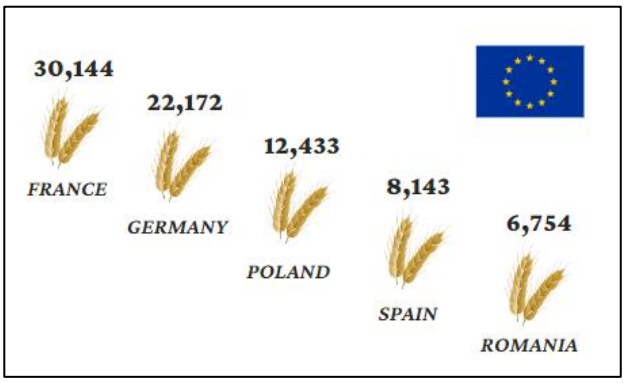

Fig. 2. Main EU wheat producing countries in 2020 (thousand tonnes)
Source: EUROSTAT data [4].

Romania ranks the first in sunflower production in 2020 with a production of 2,198.67 thousand tonnes, followed by Bulgaria with a production of 1,733.53 thousand tonnes, Hungary with 1,697.96 thousand tonnes (Fig. 3).

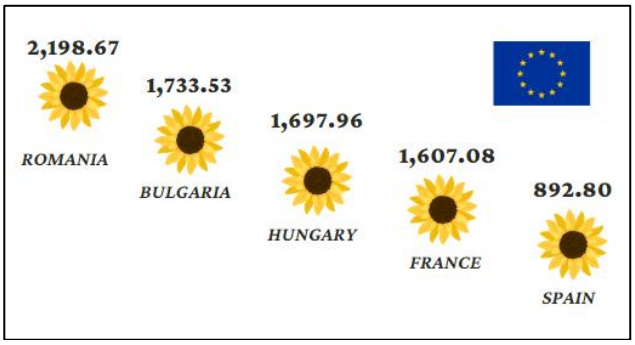

Fig. 3. Main EU sunflower producing countries in 2020 (thousand tonnes)
Source: EUROSTAT data [4].

In 2020, Romania imported €222.9 million worth of wheat at an average price of €181.9/tonne, by 5.3% more than in 2014. Of the total wheat imports, 63.1% came from Hungary (€140.6 million) at an average price of €180.9/tonne, Bulgaria (€69.8 million) 31.3% at an average price of €178.9/tonne and Slovakia (€4.1 million) 1.9% of the total wheat imports at an average price of €189.5/tonne. These price differences are mostly influenced by the distance to the importing country, the quality of the product, the quantity, and also the domestic production recorded (Table 2).

Table 2. Wheat imports and exports 2014-2020

Specification		2014	2015	2016	2017	2018	2019	2020	% from 2020	Growth rate %	CV %
Import value	**World**	115,726	115,195	331,919	202,846	115,302	158,219	222,917	100	8.9	44.4
	Hungary	24,579	50,011	179,786	107,692	30,686	82,950	140,658	63.1	24.7	71.4
	Bulgaria	79,729	48,166	109,229	74,279	70,965	65,845	69,773	31.3	-2.3	23.0
	Slovakia	970	2,007	23,254	1,593	80	459	4,177	1.9	27.6	193,5
Gini coefficient		0.70	0.57	0.60	0.61	0.64	0.64	0.68	**2020/2013**	**Growth rate %**	**CV %**
Selling price	**World**	172.5	176.6	154.0	162.3	165.8	179.7	181.9	0.6	0.09	5.9
	Hungary	179.3	183.0	157.0	162.5	173.3	189.3	180.9	-7.1	-1.05	7.2
	Bulgaria	166.5	164.8	148.9	157.3	158.1	163.2	178.9	4.8	0.67	5.6
	Slovakia	199.3	185.5	151.9	167.5	610.7	272.9	189.5	-4.9	-0.83	63.8
Value export	**World**	963,442	693,104	1,142,168	999,743	1,035,714	1,136,368	831,297	100	-2.3	15.5
	Jordan	109,323	80,588	146,076	116,720	132,523	115,372	130,724	15.7	8.5	22.2
	Egypt	361,873	224,561	202,501	171,818	188,821	266,830	116,198	14.0	-10.2	32.9
	Philippines	17,829	0	1,900	0	10,567	41,761	109,430	13.2	-	155.9
Gini coefficient		0.38	0.34	0.19	0.21	0.25	0.25	0.24	**2020/2013**	**Growth rate %**	**CV %**
Selling price	**Total**	194.0	195.0	163.3	171.0	175.9	183.6	191.4	-6.9	-1.0	7.6
	Jordan	194.7	191.1	175.6	167.9	175.3	182.6	186.5	-20.5	-3.2	10.9
	Egypt	199.9	193.7	156.1	170.3	177.0	192.2	196.4	0.5	0.1	8.4
	Philippines	172.4	-	172.7	-	163.2	175.7	178.2	3.3	-	-

Source: Own processing based on Trade Map data [16].

Regarding wheat exports, in the period 2014-2020, we note that Romania recorded a minimum value in 2015, when it was 693.1 million euros, and the maximum value was recorded in 2016, when it was 1.14 billion euros. The rate shows negative values, with a value of 2.3%, and the coefficient of variation shows a value of 15.5%, which indicates significant variations in wheat exports. largely influenced by domestic production.

In 2020, Romania exported wheat worth 831.3 million euro at an average price of 191.4 euro/tonne, by 1.4% less than in 2014. 15.7% of the total wheat export was purchased by Jordan (130. 7 million) at an average price of €186.5/tonne, Egypt (€116.2 million) 14%, at

an average price of €196.4/tonne and thePhilippines (€109.4 million) 13.2% of total wheat exports, at an average price of €178.2/tonne.

When comparing the Gini coefficients for wheat imports and exports, we observe significant differences in values, in the sense that for wheat imports the coefficients show a higher degree of concentration (0.68 in 2020), while for exports they show a lower degree of concentration, the values evenly distributed (0.24 in 2020) (Table 2).

Analyzing the value of sunflower imports in the period 2014-2020, we observe that Romania recorded a minimum value in 2014, when it was 99.5 million euros, and the maximum value was recorded in 2020, when it was 206.8 million euros. The rate shows positive values, with a value of 10.7%, and the coefficient of variation shows a value of 28.4%, which indicates significant variations in sunflower imports, influenced to a large extent by domestic production.

In 2020, Romania imported sunflowers worth 206.8 million euros at an average price of 824.9 euro/tonne, 1.4% lower than in 2014. 28.3% of total sunflower imports came from the Republic of Moldova (58.6 million euro) at an average price of 404.4 euro/tonne. Bulgaria (37.8 million euros) accounted for 18.32% at an average price of 1,164.2 euro/tonne and France (33.5 million euros) for

16.2% of total sunflower imports at an average price of 7,452.9 euro/tonne.

Regarding the sunflower export, in the period 2014-2020, we note that Romania recorded a minimum value in 2014, when its price of 396.4 euro/tonne was by 17.8% more than in 2014. About 25.6% of the total sunflower export was purchased by Bulgaria (156.6 million euros) at an average price of 364.3 euros/tonne, the Netherlands (107.1 million euros) 17.5% at an average price of 383.4 euros/tonne, and France (71.3 million euros) 11.6% of the total sunflower export at an average price of 393.5 euros/tonne (Table 3).

Table 3. Sunflower imports and exports 2014-2020

Specification		2014	2015	2016	2017	2018	2019	2020	% from 2020	Growth rate %	CV %
Import value	**World**	99,499	127,759	137,635	159,946	193,239	200,800	206,846	100	10.7	28.4
	Republic of Moldova	12,330	44,745	48,573	62,860	60,177	51,050	58,640	28.3	27.9	47.7
	Bulgaria	30,144	24,367	22,433	30,513	40,103	40,787	37,815	18.3	3.7	21.8
	France	13,673	13,669	22,498	12,850	20,715	22,182	33,501	16.2	10.0	35.2
Gini coefficient		0.36	0.40	0.40	0.43	0.38	0.36	0.36	**2020/2013**	**Growth rate %**	**CV %**
Selling price		836.6	675.1	697.9	576.7	612.9	601.9	824.9	-24.1	-3.86	23.1
		303.4	353.3	342.6	316.0	304.3	323.7	404.4	37.7	4.67	11.0
		709.0	882.0	1,086.0	696.3	843.2	760.0	1,164.2	24.2	3.15	19.3
		7,720.5	8,607.7	6,136.9	6,589.7	7,435.4	6,968.9	7,452.9	-6.7	-0.99	10.7
Value export	**World**	444,755	452,212	487,205	529,867	638,122	754,920	612,190	100	1.5	18.9
	Bulgaria	17,529	29,017	30,370	50,505	77,165	121,066	156,611	25.6	30.1	80.5
	Netherlands	47,197	110,023	98,820	90,891	117,464	123,038	107,104	17.5	1.5	23.7
	France	67,340	78,130	105,825	89,292	95,596	123,966	71,316	11.6	0.8	23.2
Gini coefficient		0.20	0.30	0.27	0.26	0.28	0.29	0.31	**2020/2013**	**Growth rate %**	**CV %**
Selling price		336.4	411.3	411.6	396.8	369.5	358.7	396.4	1.8	0.2	6.9
		713.0	455.6	465.2	507.9	359.3	334.1	364.3	-84.2	-23.2	96.6
		323.9	407.0	379.3	346.2	320.7	345.2	383.4	-6.8	-1.0	9.7
		337.5	386.3	363.7	341.1	320.4	327.3	393.5	16.6	0.7	7.8

Source: Own processing based on Trade Map data [16].

Comparing the Gini coefficient for sunflower imports and exports, we see close values of the coefficient, which indicates a uniform degree of concentration of values.

In the case of sunflower seeds, we note that this product was imported in 2020 at an average price of 7,452.9 euro/tonne from France, totalling approximately 33.5 million euro, and sunflowerseeds were traded outside the country for 71.3 million euro at a price of 393.5 euro/tonne. This can be attributed to the fact that certified seed was imported, used for crop establishment, and Romania sold sunflowers for consumption and processing (Table 3).

Analyzing the value of potato imports in the period 2014-2020, we observe that Romania recorded a minimum value in 2015, when it was 15.1 million euros, and the maximum value was recorded in 2019, when it was 66 million euros, the rate shows positive values, with a value of 13.3%, and the coefficient of variation shows a value of 52.3%, which indicates significant variations in potato imports, influenced in a large extent by domestic production. In 2020, Romania imported potatoes worth 46.6 million euros, at an average price of 233.3 euros/tonne, by 39% higher than in 2014, 24% of total potato imports came from the Netherlands (11.2 million) at an average price of €293.3/tonne, France (€9.6 million) 20.7% at an average price of €196.5/tonne and Germany (€8.3 million) 17.7% of total potato imports at an average price of €210.2/tonne.

Regarding potato exports, in the period 2014-2020, we note that Romania recorded a minimum value in 2015, when it was 212 thousand euros, and the maximum value was recorded in 2020, when it was 3.5 million euros, the rate shows positive values, with a value of 3.8%, and the coefficient of variation shows a value of 64.2%, indicating significant variations in potato exports, largely influenced by domestic production (Table 4).

In 2020, Romania exported potatoes worth 3.5 million euro, at an average price of 149.5 euro/tonne, by 1.6% more than in 2014, 45%

of the total potato export was procured by the Republic of Moldova (1.6 million) at an average price of 133.7 euro/tonne, Ukraine (824 thousand euro) 23%, at an average price of 111 euro/tonne and Poland (721 thousand euro) 20.1% of total potato exports, at an average price of 267.4 euro/tonne.

Table 4. Potato imports and exports 2014-2020

Specification		2014	2015	2016	2017	2018	2019	2020	% from 2020	Growth rate %	CV %
Import value	**World**	19,485	15,117	33,015	28,865	29,243	66,013	46,628	100	13.3	52,3
	Netherlands	4,453	2,154	4,441	2,980	4,501	12,647	11,196	24.0	26.4	72,9
	France	5,377	2,372	4,920	1,651	3,343	12,193	9,666	20.7	35.3	77,7
	Germany	2,807	2,693	5,739	3,479	4,203	9,445	8,274	17.7	9.2	48.9
Gini coefficient		0.35	0.27	0.33	0.33	0.33	0.33	0.35	**2020/2013**	**Growth rate %**	**CV %**
Selling price		167.8	140.0	200.4	212.4	198.2	317.8	233.3	64.4	7.36	28.5
		283.5	302.1	240.0	477.5	344.6	361.1	293.3	-6.2	-0.91	21.8
		108.0	72.0	213.6	168.7	119.7	268.8	196.5	60.6	7.00	41.0
		193.0	136.7	217.7	235.7	194.8	297.4	210.2	4.4	0.62	21.5
Value export	**World**	1,088	212	575	2,447	1,831	1,686	3,587	100	3.8	64.2
	Republic of Moldova	345	119	96	1818	756	503	1615	45.0	37.1	100.1
	Ukraine	0	0	0	3	0	0	824	23.0	-	281.7
	Poland	206	4	357	392	309	875	721	20.1	-6.7	76.4
Gini coefficient		0.37	0.59	0.62	0.74	0.42	0.57	0.50	**2020/2013**	**Growth rate %**	**CV %**
Selling price		147.1	129.7	245.1	120.0	154.7	307.4	149.5	-35.1	-6.0	36.2
		125.8	109.3	203.4	104.6	116.0	250.2	133.7	-13.0	-2.0	34.5
		-	-	-	136.4	-	-	111.0	-	-	-
		181.0	190.5	309.9	212.9	237.1	347.2	267.4	47.7	-1.5	23.5

Source: Own processing based on Trade Map data [16].

When comparing the Gini coefficients for potato imports an dexports, we observe significant differences in values, in the sense that the coefficients for potato exports show a higher degree of concentration (0.5 in 2020), while for imports they show a lower degree of concentration, the values evenly distributed (0.35 in 2020) (Table 4).

CONCLUSIONS

At EU level, Romania ranked the first for sunflower production in 2020, while for wheat production, it was ranked the 5th, ahead of countries such as France, Germany and Poland. In the case of potato production, Romania ranked the 7th with a production of 2,683 thousand tonnes, while Germany produced 11,715.1 thousand tonnes in the same year, topping the ranking. The problem with the decrease in potato production lies in the cost of delivery, which was found to be lower than the cost of production, with farmers having to reduce the area under potatoes.

Wheat imports in the years howed a positive annual pace of 8.9%, the main importing countries in 2020 were Hungary, Bulgaria,and Slovakia, the average purchase price was 181.9 €/tons in 2020, 5.3% lower than the price in 2014. Wheat exports also showed a positive pace of 1.5%, the main exporting countries were Jordan, Egypt and the Philippines, the average selling price of wheat in 2020 was 191.4 €/tonne. In the case of imports, according to the Gini coefficient, wheat imports had a higher degree of concentration (0.68% in 2020), while the degree of concentration of wheat exports was low.

The selling price per tonne of imported sunflower in 2020 was 824.9 euros, the main importing countries were the Republic of Moldova, Bulgaria and France. The main countries to which Romania exported sunflower were Bulgaria, the Netherlands and France, with an average selling price of 396.4 euro/tonne. For imports and exports, the Gini coefficient shows a uniform concentration fence.

For potato cultivation, imports showed a positive annual rhythm, 24% of total potato imports came from the Netherlands (11.2 million euro) at an average price of 293.3

euro/tonne, France (9.6 million euro) 20.7% at an average price of 196.5 euro/tonne and Germany (8.3 million euro) 17.7% of total potato imports at an average price of 210.2 euro/tonne. In 2020, Romania exported €3.5 million worth of potatoes at an average price of €149.5/tonne, up 1.6% on 2014, accounting for 45% of total potato exports, and was purchased bythe Republic of Moldova (€1.6 million) at an average price of €133.7/tonne, Ukraine (€824. 000) accounted for 23%, with an average price of €111/tonne, and Poland (€721,000) accounted for 20.1% of total potato exports, with an average price of €267.4/tonne.

The Gini coefficient shows that in the case of imports, the values are evenly divided due to the low degree of concentration, while in the case of exports, the degree of concentration is higher.

According to the data analysed, the wheat and sunflower areas and production show positive annual rates, which ensure Romania's food security.

In order to improve both production and agricultural areas, the size of farms needs to be optimised by encouraging associations between farmers, and the way subsidies are granted needs to be improved.

The main problem with the development of agriculture is the low level of infrastructure and logistics, which affects the production potential on the cereals market. Another major problem for Romania is the export of non-value-added products and value-added imports, both for wheat and sunflowerseeds.

With Romania's accession to the European Union, the degree of competitiveness of agri-food products has increased, and there is a permanent trade in the Black Seaports, as this region is one of the largest grain markets in Europe.

It is worth mentioning that Romania is a member of the European Union, and the prospects regarding the Green Deal pact force the member states to make the transition to org anic farming, but the real issue will be whether the agricultural sector will be able to cope with medical and political disruptions to ensure food security, as organic farming is more expensive and less productive than conventional farming [11].

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