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ANALYSIS OF THE MAIN TECHNICAL INDICATORS OF CORN, WHEAT AND SUNFLOWER CROPS AT THE LEVEL OF THE EUROPEAN UNION

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Abstract

The content of this paper aims to analyze the main technical indicators of three of the most important crops in the European Union, namely corn, wheat and sunflower. By interpreting the statistical data provided by Eurostat on the cultivated area, the total production and the average production of the three crops mentioned above using the trend, the standard deviation and the coefficient of variation, an analysis of the Member States of the European Union will be carried out in order to determine which of them dominates the crop sector of corn, wheat and sunflower, in the end to figure out that not one of the analised Member States can be called the leader regarding the agricultural sector, because the results are so different beeing influenced by so many external factors.

Key words**:** *cultivated area, total production, average production, wheat, corn, sunflower*

INTRODUCTION

The European Union's concern for the agricultural sector has been present since its inception, to be more explicite since 1957, when the European Economic Community was set up. This clear concern for agriculture, and not only, was the result of the food concerns that preceded World War II [6, 1].
Under the 1957 Treaty of Rome, economic conditions such as the facilitation of trade between European states, European regulation of the market for agricultural products, the development of a common vision of protecting farmers' incomes, and the political will of that time were established one of the most important common policies, namely the Common Agricultural Policy [9, 4].
Playing a pioneering role in the process of integration into the European Union, being one of the foundations on which what we know today as the European Union was built, the Common Agricultural Policy is a partnership between agriculture and society, especially between Europe and farmers. The aim of this policy is to support farmers in improving agricultural productivity with a view to a stable supply of food at affordable prices, to protect farmers so that they can ensure a decent living, to contribute to the sustainable management of natural resources and in combating climate change, preserving landscapes and rural areas and last but not least maintaining the economic vitality of rural areas by promoting jobs in the agricultural, agri-food and other associated sectors [8, 7].
The agricultural sector has always been given increased attention not only because it is the activity of extracting or harvesting products from the soil, but also because it is part of the primary sector of the world economy, but especially because, although it is not the sector that brings the highest incomes, especially its contribution to the GDP of the European Union being very small, in 2020 agriculture contributing only 1.3% to the gross domestic product of the European Union [2], the forecast according to which worldwide, by 2050, world food production needs to be doubled to meet the needs of a growing population with resource-intensive eating habits [10, 11] is a wake-up call.
Given that the common agricultural policy is an extremely integrationist policy, agricultural policies in the Member States of the European

Union are largely replaced by common rules on the functioning of markets and the marketing of products, so all Member States are in line with the terms and conditions imposed by the common agricultural policy, it is necessary to carry out an analysis of the situation of the main technical indicators for three of the most important crops in the European Union, namely maize, wheat and sunflower.

MATERIALS AND METHODS

Starting from one of the definitions of statistics, namely: statistics is the science through which numerical data are collected, classified, presented and interpreted in order to draw conclusions and make decisions [8] and extracting numerical data relevant to the analysis that is wishes to be carried out in the framework of Eurostat (ec.europa.eu/eurostat), the body responsible for statistics at EU level, the area under cultivation, the average production and the total production for maize, wheat and sunflower crops will be interpreted to determine which of the EU Member States dominates the agricultural sector in the case of these three crops.

Statistical data will be interpreted by determining the trend they know, the trend representing the general trend that a series of values knows, highlighting the movement, the evolution of the values of the same data set in a well-established period of time [3].

In order to analyze in depth the statistical data series, they will be interpreted using the standard deviation and the coefficient of variation, as well as by determining the arithmetic mean, the minimum and the maximum. The standard deviation helps us to quantify the spread of numerical data in the interpreted data series. Representing the average square root of the set of deviations of each element of the mean of the set, this indicator determines the measure of the degree of data scattering and is measured in the same unit of measurement as the initial data.

The coefficient of variation is determined by relating the standard deviation of the data series to its arithmetic mean, therefore it allows the comparison of the analyzed statistical data series, from the point of view of the standard deviation. The coefficient of variation is expressed as a percentage, and the lower this indicator, the closer to the values in the series.

RESULTS AND DISCUSSIONS

As we mentioned earlier in the introduction of this paper, after World War II, politicians in many European countries at the time concluded that in order to avoid a new armed conflict, the best solution for the European continent was to do an economic and political union. Based on these discussions in 1950, the French Foreign Minister, Robert Schuman, proposed the inclusion of the coal and steel industries in Western Europe. Following this proposal, in 1951 Belgium, France, Italy, Luxembourg, the Federal Republic of Germany and the Netherlands laid the foundations of the European Coal and Steel Community, known as the ECSC. Six years later, the European Energy Community, or Euratom, and the European Economic Community (EEC) are set up following the signing of the Treaty of Rome, which states that the aim of the Member States was to remove trade and tariff barriers between them and strengthen a common market. The three communities merged in 1967, merging the ECSC, the EEC and Euratom, leading to the establishment of three new institutions, the European Commission, the Council of Ministers and the European Parliament. In 1973, after the failure of the first draft of economic and monetary union in 1970, the 6 states were joined by Denmark, Ireland and the United Kingdom. After 6 years, the European Monetary System (EMS) was consolidated in 1979, introducing fixed but still adjustable exchange rates, of course between EEC Member States. After 2 years, Greece joined the EEC, and then after another 5 years, in 1986, Spain and Portugal also joined. Also in the same year, 1986, the idea of economic and monetary union, originally outlined in the Werner Report in 1970, was relaunched at the same time as the adoption of

the Single European Act (EEA), and in 1988, 18 years after the first draft, the European Council confirmed EMU (Economic and Monetary Union), thus setting up a committee of experts, chaired by the President of the European Commission, Jacques Delors, proposing a three-stage transition process, as set out in the Delors Report. One year later, in 1989, negotiations began on the Maastricht Treaty, beginning negotiations on the European Union, thus laying the foundations for the EU and the provisions for the establishment of EMU and the establishment of the European Central Bank. The Maastricht Treaty was signed only in 3 years, in 1992, introducing new forms of cooperation in new areas such as defense, justice and home affairs, laying the foundations for the European Union with the signing of the Treaty. Although signed in 1992, the Treaty did not enter into force until 1 November 1993, after it had been ratified by the 12 Member States. Austria, Finland and Sweden joined the European Union in 1995. In the period 1990-1999, the Monetary Economic Union was achieved in three stages, as established. In 2002, the use of euro coins and banknotes was introduced in 12 EU Member States. In 2004, on 1st of May, the largest wave of accession to the EU is taking place, with Cyprus, Estonia, Latvia, Lithuania, Malta, Poland, the Czech Republic, Slovakia, Slovenia, and Hungary joining the European Union. Later, after 3 years, in 2007, joined also Romania and Bulgaria. The Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community enters into force in 2009. In order to ensure financial stability and improve the European Union's supervisory framework, the European Banking Authority, the European Insurance and Occupational Pensions Authority and the European Real Estate and Markets Authority and the European Seismic Committee are hereby established. In 2013, Croatia joins the European Union. In 2020, a premiere has ocured regarding the membership of a state in the European Union, year in witch a member of the EU has withdrawn from it, United Kingdom marking in this way a very important moment in the history of the European Union making [10][3].

Taking into consideration all of the above, especially the fluctuation of the number of members from the European Union in the laste past years, the analysis that wants to be determinated regarding the main technical indicators for corn, wheat and sunflower crops will be determinated at the level of the member states that have available statistical dates on the Eurostat platform at this point.

Considering the fact that three staple foods that are found in any hosehold from the European Union, respectively flour, cornmeal and sunflower oil come from some of the most widespreaded crops that are wheat, corn and sunflower, this three crops was selected for the analysis in this article.

Corn

According to statistical data provided by Eurostat on the area under corn, for both total and average corn production in 21 Member States within the European Union, there were calculated the minimum and maximum averages, the standard deviation and the coefficient variation of the three technical indicators of maize cultivation.

The area under corn has the lowest value over the reference period in 2020 in Luxembourg and the highest value in Romania in 2004. Judging by the average area under maize calculated for each of the 21 countries analyzed, the highest value of this calculated indicator was determined in Romania, and the minimum values in Sweden and Luxembourg. France is the second classed, with an average of 36% lower than Romania. The third ranked is Hungary, having a average area with 56% less than Romania.

Following the determination of the standard deviation regarding the maize cultivated area, in the first four places are Romania, Italy, Poland and France, in that order, so in the case of these four countries were recorded the most varied values of the area cultivated with corn in the mentioned period.

Yet, the coefficient of variation determined in the case of the area cultivated with corn, shows that in the case of Romania, the values of the area cultivated with corn determine a high degree of homogeneity, therefore the

values determined during the analyzed period are not very different from the average. The same can be said for Italy and France, and for Poland, where the value of the coefficient of variation reaches almost 40%, we can deduce that the values on which the area under maize in this state during the analyzed period are quite different. The same is true for Luxembourg, Lithuania, Denmark and Sweden, where the value of the coefficient of variation increases from state to state (Table 1).

Table 1. Analysis on the area cultivated with maize, the total production and the average production of maize at the level of 21 member states of the European Union in the period 2002-2020

Country	Cultivated area (thousand hectares)				Total production (thousand tonnes)				Average production (tonnes / ha)			
	Min/ Max	Avg	Std. Dev	C.V.	Min/ Max	Avg	Std. dev.	C.V.	Min/ Max	Avg	Std. dev.	C.V.
Romania	2,094.2/ 3,196.1	2,580.9	261.2	10.1	3,853.9/ 18,663.9	10,668.8	3,650.6	34.2	1,703/ 7,6368	4.1	14.2	34.3
France	1,426.3/ 1,843.5	1,643.5	141.2	8.6	11,839.7/ 18,343.3	14,478.6	1,719.8	11.9	7,1502/ 10,1239	8.8	7.5	8.5
Hungary	939.1/ 1,242.6	1,127.9	96.1	8.5	4,026.7/ 9,315.1	7,326.7	1,563.8	21.3	3,7327/ 8,6301	6.5	15.4	23.6
Poland	262/ 946.1	482.5	190.4	39.5	1,260.7/ 6,694.7	3,012.2	1,389	46.1	4,1609/ 7,3481	6.2	8.8	14.4
Italy	591.2/ 1197	904.7	203.9	22.5	6,048.5/ 11,368	8,441.2	1,623.1	19.2	7,4811/ 11,2682	9.5	9.1	9.6
Bulgaria	214.4/ 581.5	394.2	93.8	23.8	980.1/ 4,059.8	2,174.6	860.8	39.6	2.8/ 7,9225	5.4	13.4	24.7
Germany	398.7/ 526.2	450.8	39.8	8.8	3,220.3/ 5,514.7	4,216.4	655.9	15.6	7,3845/ 10,6838	9.3	9.1	9.7
Spain	315/ 479.9	384.7	52	13.5	3,324.8/ 4,885	4,094	482.3	11.8	9,0408/ 12,2581	10.7	9.3	8.7
Croatia	235.4/ 319	285.1	25.5	8.9	1,279.6/ 2,504.9	1,933.7	357	18.5	4,1993/ 9,1238	6.8	14.5	21.2
Austria	181.2/ 220.7	203.6	11.6	5.7	1,637.9/ 2,453.1	2,076.6	267.9	12.9	8,1173/ 11,3449	10.2	9.4	9.2
Slovakia	140.4/ 221.5	176.1	26.7	15.2	601.4/ 1,814.1	1,145.8	361.9	31.6	3,9675/ 9,2537	6.5	15.8	24.6
Greece	113.5/ 269.1	194.2	52.6	27.1	1,178.1/ 2,820.2	2,042.2	508.5	24.9	9,9543/ 11,6702	10.6	5.1	4.8
Czech Republic	70.6/ 121	94.7	14.6	15.5	442.7/ 1,063.7	708.6	170	24	5,5358/ 9,7882	7.5	12.7	17.0
Portugal	73/ 141.4	103.2	19.7	19	514.4/ 929.5	734.6	113.3	15.4	4,6805/ 9,8043	7.3	15.1	20.7
Belgium	47.4/ 74.2	58.4	8.7	14.9	376.6/ 859.7	632	147.3	23.3	6,9744/ 13,1278	10.8	16.0	14.9
Slovenia	36.4/ 46	40.3	2.9	7.3	224.2/ 429.9	322.3	51	15.8	5,0802/ 10,7914	8.0	14.1	17.5
Lithuania	1.4/20. 2	9.2	5.9	64.1	2.7/ 141.7	56.5	44.8	79.3	1/7,6719	5.1	20.5	40.0
Netherlands	8.4/24. 5	17.3	4.8	27.5	84.6/ 252.3	178.7	48.5	27.1	6,4884/ 13,7419	10.5	21.1	20.0
Denmark	0/12.9	4.9	4.8	98.2	0/75.7	30.3	28.9	95.5	0/7,6842	3.7	33.1	90.0
Sweden	0/1.9	0.2	0.6	243	0/12.5	1.5	3.8	255. 6	0/6,9753	0.9	22.9	243.7
Louxembu rg	0.1/0.5	0.2	0.1	46.3	0.5/3.6	1.8	0.9	49.4	4,7143/ 10,8	7.2	15.6	21.7

Source: Eurostat [5], Accessing and processing data in March 2022.

In the case of total corn production, the ranking of the first three ranked states is similar to that of the area cultivated with maize, except that, in this case, Romania reaches the second position, being overtaken by France, while the third position is occupied by Italy, in terms of the calculated average, Hungary ranks fourth in this ranking. With the highest value of total maize production during the analyzed period, determined in 2014, France has an average higher by 26.31% than that of Romania, by 49.39% higher than that of Hungary and with almost 100% higher than the last-ranked state, Sweden. In the case of Romania, the most diversified values of the total maize production were registered. However, given that it has one of the highest total maize production during the period

considered, this maximum value of the standard deviation is not extremely surprising, but on the other hand it should not be neglected. Regarding the average maize production, the classification is extremely different from that found for maize and total maize production. Regarding the average maize production carried out during the analyzed period, Belgium, Spain and Greece are in the first places, while Romania is only on the 19th position, the average determined in Romania representing 38% of the average determined in Belgium, France in 8th place, with an average of almost 82% of the Belgian average, and Hungary in 14th place, with an average of almost 61% of the Belgian average.

The coefficient of variation is situated below 30% in 18 states, in of 10 of those the indicator is under 10%, more than that, in case of 6 countries the value determinated is below 10%. Even thow Romania has a great spot in the ranking regarding the production of maize, in this situation records the most varied values, the average maize production of this country fluctuating the most during the 19 years analyzed.

Wheat

As far as wheat cultivation is concerned, its analysis will be carried out in 27 Member States of the European Union over 19 years, respectively in the period 2002-2020. In the case of wheat, the first four countries are France, Germany, Poland and Romania, and the last three are Cyprus, Luxembourg and Malta. Registering the highest value in 2016 in France and the lowest values during the period analyzed in Malta, about the average area cultivated with wheat we can say that the highest average value of this indicator was recorded in France, Germany having an average of the cultivated area with wheat is almost 41% lower than that of France, Poland by 56%, and Romania by 60%.

Even thow the first four countries ranked are registering also the heightest values of the standard deviation, the coefficient of variation determinated in the case of the four help us conclude that the values of the average area cultivated with wheat it dosen't register major changes during the 19 years analyzed.

The same conclusion is valid also for a major part from the others contries analized, in which cases, the coefficient of variation is registering values below 30% , it can be said that the values that the area cultivated with wheat has had over time are quite close. The non-compliant countries are Lithuania and Latvia, where the coefficient of variation slightly exceeds the 30% threshold, Malta, the country where the exposed indicator reaches 46%, and last but not least Portugal, the country where the coefficient The rate of change is almost 77%, so Portugal is the country in whose territory the most varied values of the area under wheat have been recorded over the 19 years referred to.

In the case of total wheat production, the highest value recorded during the analyzed period was in France in 2015, and the lowest values are also, as in the case of the area on the territory of Malta, during the whole period analyzed. The highest averages of wheat production were recorded in France, Germany, Poland and Italy, and the lowest averages in the same three countries as in the case of the area cultivated with wheat, meaning Luxembourg, Cyprus and Maltta.

In the majority of states, the determinated values of the coefficient of variation are below 30%, Belgium beeing the state where this indicator has the lowes value, but in 7 of the states the coefficent of variation exceeds the threshold of 30%, even more than that, in 3 of the 7 contries, namely Estonia, Latvia and Cyprus, the indicator is recording a value over 50% and in the case of 2 of the 7, Malta and Portugal, the coefficient of variation is over 70%.

Even if, in the case of the surface cultivated with wheat and the total production of wheat, the ranking was similar, in the case of the average production, an indicator determined on the basis of the area cultivated and the total production obtained, the situation is slightly different. During the analyzed period, the first three are in this case Ireland, Belgium and the Netherlands, France is in seventh place, Germany is in fourth place, Poland is in 17th place, Italy is in 21st place and Romania is only 24th. three positions are Greece, Portugal and Cyprus. It is not enough for a state to

have a large area cultivated with wheat, or for the total wheat production determined at the state level to be the highest, because in terms of average production, other factors come into play, such as This indicator can be seen by comparing this indicator with the rest of the indicators analyzed in terms of wheat cultivation, factors including pedo-climatic conditions, irrigation systems that a state has and last but not least, the concern that Member States' governments have in as far as this agricultural sector is concerned, even if, being states of the European Union, all 27 countries have to follow the regulations of the Common Agricultural Policy (Table 2).

Table 2. Analysis on the cultivated area with wheat, the total production and the average production of wheat at the level of 27 member states of the European Union in the period 2002-2020

Country	Cultivated area (thousand hectares)				Total production (thousand tonnes)				Average production (tonnes / ha)			
	Min/ Max	Avg	Std. Dev.	C.V.	Min/ Max	Avg	Std. Dev.	C.V.	Min/ Max	Avg	Std. Dev.	C.V.
France	4,512.4/ 5,542.2	5,254.7	231.5	4.4	29,316.3 /42,750	36,740.4	3,695.8	10.1	5.3/7.8	7	0.6	8.7
Germany	2,835.5/ 3,297.7	3,128.3	121	3.9	19,259.8/ 27,784.7	23,495.1	2,265	9.6	6.5/8.6	7.5	0.6	7.5
Poland	2,077.2/ 2,511.3	2,292.3	121.9	5.3	7,059.7/ 12,433.2	9,740.3	1,376.1	14.1	3.2/5.2	4.2	0.5	11.6
Romania	1,410.9/ 2,448.1	2,080.4	204	9.8	2,479.1/ 10,297.1	6,829.1	2,187.7	32	1.6/4.9	3.3	1	29.5
Spain	1,772.8/ 2,406.6	2,075	165.9	8	4,026.7/ 8,322.5	6,397.7	1,173.8	18.3	1.8/4.3	3.1	0.6	19.1
Italy	1,711.2/ 2,415.5	1,967.3	220.6	11.2	6,229.5/ 8,855.4	7,286	681.1	9.3	2.7/4.2	3.7	0.3	9
Bulgaria	841/ 1,368.6	1,150.5	120.2	10.4	2,003.9/ 6,319.6	4,508.3	1,192.7	26.5	2.2/5.4	3.9	0.9	22.5
Hungary	936.6/ 1,173.8	1,066.7	66	6.2	2,941.2/ 6,006.8	4,762.2	806.4	16.9	2.6/5.5	4.5	0.8	18.1
Lithuania	335.1/ 895.8	587.4	215.1	36.6	809.8/ 4,818.8	2,504.1	1,228.5	49.1	2.4/5.4	4.1	0.7	17.6
Czech Republic	648.4/ 863.2	818.1	45.9	5.6	2,637.9/ 5,454.7	4,444.4	729.2	16.4	4.1/6.5	5.4	0.7	13.5
Denmark	425.8/ 763.6	631.3	84.3	13.4	2,623.9/ 5,940.4	4,621	658	14.2	6.2/8.2	7.3	0.6	8.5
Latvia	153.5/ 498.2	324.4	118.7	36.6	468.4/ 2,659.6	1,309.5	697.6	53.3	2.8/5.3	3.8	0.8	20
Sweden	323.3/ 472	399.7	47.3	11.8	1,620.3/ 3,476.8	2,478.5	546.6	22.1	4.3/7.4	6.2	0.8	12.4
Slovakia	306.9/ 416.6	374.8	25.5	6.8	930.4/ 2,434.2	1,688.1	370.5	21.9	3/5.8	4.5	0.8	17.8
Greece	350.5/ 870	652.5	172	26.4	979.2/ 2,139.5	1,684.9	358.3	21.3	2/3.1	2.6	0.3	10.4
Austria	272/ 315.1	295	11.5	3.9	1,191.4/ 1,970.4	1,554.4	198.5	12.8	4.1/6.3	5.3	0.6	11.4
Finland	174.5/ 267.4	212.9	24.2	11.4	501.6/ 1,088.2	802.7	144.1	18	2.8/4.6	3.8	0.4	10.5
Belgium	191.2/ 217.1	204	7.1	3.5	1,400.1/ 2,019.3	1,768.1	153.4	8.7	6.8/10	8.7	0.7	7.9
Estonia	64.5/ 169.8	123.8	36.5	29.5	144.9/ 846.6	437.8	227.5	52	2.2/5.1	3.3	0.9	27
Croatia	118.4/ 204.5	161	20.4	12.6	506.2/ 999.7	794.4	132.1	16.6	3.2/5.9	5	0.7	14.3
Netherlands	108.9/ 156.5	137.1	14.7	10.7	931.8/ 1,402	1,180.9	147	12.4	7.3/9.4	8.6	0.6	6.5
Ireland	47/ 110.7	80.7	18.1	22.4	364.9/ 1,019.2	722.1	164.4	22.8	7.2/10.7	9	0.9	10
Portugal	27/ 230.7	78.1	59.9	76.7	51/413	129.5	95.3	73.6	0.7/2.8	1.9	0.6	32.9
Slovenia	26.7/ 35.7	31.6	2.8	9	121.9/ 188.1	149.4	17.7	11.9	3.5/5.8	4.7	0.6	12.1
Cyprus	5/12.5	7.9	2.4	30	2.5/35.4	15.9	9.2	57.9	0.5/3	1.9	0.7	37.2
Luxembourg	11.2/ 14.7	13.1	1.1	8	68.6/ 97.8	79.4	8.3	10.5	5.1/6.8	6	0.4	7
Malta	0/3	2.1	1	46.1	0/14.5	8.2	5.8	71.1	1/5	4.1	1.4	34.8

Source: Eurostat [5], Accessing and processing data in March 2022.

The coefficient of variation determined in the case of average wheat production does not exceed the threshold of 30% except in the case of Portugal, Malta and Cyprus, but also in their case does not exceed 40%, therefore we can say that in terms of average wheat production at the level of the 27 states analyzed, over the 19 years taken into account, the determined values do not show significant differences, a conclusion that can be strengthened after analyzing the values of the determined standard deviation, sufficiently small values that indicate that the degree of spread of the values around the determined average is very small (Table 2).

Sunflower

As regards sunflower cultivation, the analysis will be carried out over the same period as in the case of maize and wheat, respectively the years 2002-2020, but this time only 16 Member States of the European Union will be analyzed, the only ones for which data were available on Eurostat.

Regarding the area cultivated with sunflower, as well as the total production of sunflower, we can easily say that in the first place in the case of these categories is Romania, the country in which the maximum area cultivated with sunflower was recorded in 2019, as well as the maximum total sunflower production in the same year. The next ranked, regarding the area cultivated with sunflower are Bulgaria, whose average productions during the analyzed period represent 75% of the surface of Romania, on the third place is Spain, whose average represents 74% of the average calculated in Romania, and on the fourth position is France, a country whose average represents 66% of the average calculated in Romania. Given that data from Eurostat have shown that there is not enough data in Ireland to make a proper comparison, we conclude that the latest states in the ranking of the area cultivated with sunflower in the European Union are Poland and Slovenia, with incomparably lower averages than the first ranked. The coefficient of variation in the case of the area cultivated with sunflower in the case of the first ranked indicates that the data analyzed during the reference period did not change considerably, therefore the area cultivated with sunflower did not change significantly in the 19 years analyze, which is true for most states in the first half of the rankings. Higher values of the coefficient of variation were determined in the countries in which the area cultivated with sunflower were smaller. As it was mentioned earlier, Romania is the country in which case it was determinated the hightest value of the sunflower production, followed as the second ranked by France, whose average is with 20% lower than Romania's average, then the third ranked is Bulgaria, with an average with 24% smaller than Romania, and on the fourth position is Hungary whose average is 28% lower than Romania's. In this case, too, disregarding Ireland, as there is insufficient data to compare in this case, the last countries ranked in terms of average total sunflower production over the 19 years analyzed are Poland and Slovenia. Taking into consideration that in this case, the coefficient of variation reaches very high values, almost half from the analyzed countries have determinated coefficient of variation that exeeds 30%, so in the case of this states there is a rather large difference between the anual values, and also the fact that regarding the coefficient of variation determinated for the total production of sunflower the countries that have the largest production of sunflower are also the ones that have a huge coefficient of variation, we can say that the total production of sunflower is the one who has the most fluctuating values from the three cultures analyzed.

France is that one contry in case of which the coefficient of variation determinated is the lowest from the 16 states examed, so in case of France the values of the sunflower production recorded over the 19 years analized are the most similar, beeing the most stable, fact that is not aplicable for Romania in wich case the coefficient of variation is extremly high and also fo Bulgaria and Hungary whose coefficient of variation is a little bit lower than Romania's.

We saw that the classification of the average production of wheat an maize is very different regarding the first positions, from the classification of the cultivated area and the

total prodution and a similar thing is hapening also in the case of the sunflower culture. As far as it goes the average sunflower production, the highest value was recorded in Austria in 2016, Austria whose average area under sunflower is 2.5% of the Romanian average and was ranked in the ranking of area under sunflower on the 12th position, and whose average total production represents 3.6% of the average total production of the first ranked, Romania, being in the ranking on the total production of sunflower on the tenth position.

Table 3. Analysis of the area cultivated with sunflower, the total production and the average production of sunflower at the level of 16 member states of the European Union in the period 2002-2020

Country	Suprafața cultivată (mii hectare)				Total production (thousand tonnes)				Average production (tonnes / ha)			
	Min/ Max	Avg	Std. Dev.	C.V.	Min/ Max	Avg	Std. Dev.	C.V.	Min/ Max	Avg	Std. Dev.	C.V.
Romania	748.5/ 1,282.7	981.1	144.4	14.7	546.9/ 3,569.2	1,794.3	760.8	42.4	0.7/3	1.8	0.6	33.7
Bulgaria	471/ 898.8	739.5	109.8	14.8	564.4/ 2,057	1,443.2	480	33.3	0.9/2.5	1.9	0.4	22.6
France	519.5/ 778.4	648	74.2	11.5	1,172.4/ 1,880.7	1,495.1	185.2	12.4	1.9/2.7	2.3	0.2	8.6
Spain	516.2/ 862.9	725.5	87.5	12.1	381.3/ 1,090.2	815.5	156	19.1	0.7/1.4	1.1	0.2	14.7
Hungary	418/ 694.5	561.5	64.9	11.6	776.9/ 2,022.3	1,392.7	343	24.6	1.9/3	2.5	0.4	15.5
Italy	100.5/ 167.1	122.9	16.4	13.3	185.5/ 351	268.1	36.3	13.6	1.6/2.5	2.2	0.2	10.6
Greece	4.7/ 100.7	50.1	35.6	71.1	7.6/299	120.4	96.6	80.2	1.4/3	2.1	0.5	21.7
Slovakia	48.6/ 131	81.4	18.7	23	116.9/ 252.7	187.2	38.6	20.6	1.8/3	2.3	0.3	14.2
Croatia	20.6/ 49.8	33.9	6.7	19.9	54.3/ 130.6	91.7	22.6	24.7	1.6/3.2	2.7	0.4	14.6
Germany	16.7/ 37.2	24.5	5.4	22.1	35.3/73	51.9	11.5	22.1	1.8/2.7	2.1	0.2	10.6
Austria	18.2/ 34.6	24.4	4.1	16.8	38.1/ 84.6	64.1	12.1	18.9	2/3.3	2.6	0.3	12
Czech Republic	11.3/ 48.7	25.8	10.8	42	28.8/ 114.5	59.6	24	40.2	2/2.9	2.3	0.2	8.3
Poland	0.6/7.4	2.9	1.7	56.8	0.8/14.9	5.1	3.1	61.4	1.2/2	1.7	0.2	11.2
Portugal	6.4/ 37.6	18.1	9.1	50.5	2.4/26.2	14.1	6.4	45.1	0.3/1.7	0.9	0.5	52.1
Slovenia	0/0.4	0.2	0.1	47.1	0/1	0.5	0.3	61.9	1.1/2.9	2	0.5	26.8
Ireland	0/0	0	0	299. 5	0/0.2	0	0	435. 9	0/1.6	0.1	0.4	435.9

Source: Eurostat [5], Accessing and processing data in March 2022.

However, the highest average average sunflower production over the analyzed period was determined in the case of Croatia, which ranked ninth in the ranking of the analyzed Member States for the area cultivated with sunflower, the average cultivated area with the sunflower of this state representing 3.5% of the Romanian average and on the same position in the ranking based on the total sunflower production obtained, the average of the total sunflower production of Croatia representing almost 3% of the average total production of sunflower determined in Romania. Croatia is followed in this ranking by Austria in second place and Hungary in third. With the exception of two countries, without taking Ireland into account, the coefficient of variation determined did not exceed 30%, so it can be concluded that in most of the countries analyzed, the average values of sunflower production are quite stable, without significant differences were recorded over the years analyzed, a conclusion reinforced by the fact that the value of the coefficient of variation determined in 9 of the 14 states analyzed was below 15%.

CONCLUSIONS

After analyzing the main technical indicators of wheat, corn and sunflower crops, we can

conclude that the size of the cultivated area and the total production obtained at the level of a state are not enough for it to be considered one of the giants of European agriculture. This conclusion is due to the fact that in the case of each of the three crops analyzed, the first three or four Member States ranked in terms of average total area or total production were almost never the first Member States ranked in terms of average of the average production obtained. Starting from the definition of average production, referred to in the statistical field as yield, this indicator representing the quantity of product obtained per unit of cultivated area [1], it is easy to understand that the states that occupy the first places in the ranking for cultivated area, such as were determined in the case of maize: Romania, France, Hungary, Italy, in the case of wheat: France, Germany, Poland, Romania and in the case of sunflower: Romania, Bulgaria, Spain, France, or the Member States which occupied the first place in the ranking in terms of total production obtained at state level, as determined for maize cultivation: France, Romania, Italy, Hungary, for wheat cultivation: France, Germany, Poland, Italy and for sunflower crops: Romania, France, Bulgaria, Hungary, can not be called the main dominators of the corn, wheat and sunflower crops sector, because the best yield ie the countries in which the highest average production values were determined were, in most other cases, in the case of maize: Belgium, Spain and Greece, in the case of wheat: Italy, Belgium and the Netherlands. , and in the case of sunflower cultivation: Croatia, Austria and Hungary. However, the interpretation remains debatable, because both aspects are of major importance, not being able to compare a state that benefits from a much larger area on which the three crops are cultivated and for which the total production will automatically be higher, with a state that has a smaller crop area, therefore a smaller yield, but whose average yield, so yield is much higher.

Although, as we mentioned throughout the paper, the European Union's Common Agricultural Policy obliges all Member States to comply equally with the terms and conditions imposed by this policy, there are differences that lead to questions about the most important countries of the european agriculture. Certainly, this discrepancy between the fundamental states, analyzing from the point of view of the three technical indices of the crops in question, comes from the differences of pedo-climatic conditions specific to each state, the way in which they are kept under control by implementing soil erosion measures, the need for irrigation or cooperation, existing there by 2020 (the last year in question) a large number of Member States in which farms in subsistence or semi-subsistence categories dominated.

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