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EFFICIENCY OF THE AGRICULTURAL LAND USE IN THE EUROPEAN UNION

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Abstract

The paper analyzed the efficiency of the utilization of the agricultural land in the EU-28 and in each country based on a system of specific indicators, among which the most important ones have been the agricultural production and gross value added per ha of utilized agricultural land. The data provided by Eurostat were processed establishing the average level in the decade 2009-2018 both at the EU and every country level. The comparison among countries was based on the EU- mean resulting in this interval. The results proved that 71.46 % (128.55 Mil. ha) of the EU-28 agricultural land is used by France, Spain, United Kingdom, Germany, Poland, Romania and Italy. About 77.58% of the EU agricultural output is produced by France, Germany, Italy, Spain, United Kingdom, Netherlands, Poland and Romania. The highest agricultural output per ha of used area was achieved by Malta, Cyprus, Belgium, Italy, Denmark, Germany, Luxemburg, Slovenia, Austria and France. About 86.65 % (Euro Bil. 144.72) gross value added is produced in agriculture by Italy, France, Spain, Germany, United Kingdom, Netherlands, Poland, Romania, Greece and Hungary. Only Italy, Spain, Greece, Cyprus, Croatia, Romania and Malta exceeds 40.95 %, the EU-28 average share of gross value added in the value of agricultural output. The EU achieved Euro 671.1 per ha of utilized land and 15 member states are able to exceed it (Malta, Netherlands, Cyprus, Italy, Belgium, Germany, Greece, Spain, Austria, Denmark, Slovenia, France, Luxemburg, Croatia and Portugal). As a conclusion, taking into account the two indicators: agricultural output and gross value added per ha of utilized area, the countries with the highest economic efficiency of land use are Malta, Cyprus, Italy, Belgium, Germany, Denmark, Austria, Greece, Slovenia, Luxemburg, France, Spain, Netherlands, Portugal and Croatia. To make land use more efficient in agriculture, farmers have to optimize the combination of production factors in order to grow agricultural production and gross value added per ha.

Key words**:** *agriculture, land use, efficiency, agricultural production value, gross value added, European Union*

INTRODUCTION

Agricultural land is the most precious capital because it is destined to "produce food for humans by cultivating crops and rearing livestock" [20].

Between the surface of agricultural land and the utilized area, it is a difference because not all the land is worked for many reasons. According to the definition given by European Commission**, "**utilized agricultural area includes arable land, permanent crops and grassland, kitchen gardens etc"[3].

The way in which agricultural land is used by farmers could led to economic efficiency or not.

The large heterogeneity of agricultural land geographical position, soil structure and quality, the diversity of climate conditions, technical endowment in working land, applied technologies, agricultural inputs for farming, labor productivity and farming practices have a deep impact on the level and growth rate of agricultural output and gross value added in the agriculture of the EU countries [12].

The value of agricultural output is determined by two factors: gross value added and intermediate consumption. Both gross value added and intermediate consumption have a positive influence, meaning that the higher their levels, the higher the agricultural output.

Agriculture is an important economic sector contributing to GDP. In some EU countries, its contribution has a high level, while in other member states the share of agriculture in GDP is lower [16].

The statistical data reflect an ascending trend in agricultural output and gross value added during the last decade, but from an EU country to another the situation is different. However, in 2016, the contribution of agriculture to the EU GDP decreased as the overall agricultural growth has been stagnating in comparison with the main competitors such as China, the US and Brazil [1].

In the EU-28, about 48 % of the area is represented by agricultural land, whose figure accounted for 171,228,500 ha in 2016. More than 50 % of the EU agricultural area is worked by four countries: France, Spain, United Kingdom and Germany [2, 8, 9, 19].

The EU agriculture is sustained by 10.321.200 holdings, of which about 66 % are small sized holdings less than 5 ha. About 67 % of the EU farms are situated in Romania (33%), Poland (14%), Italy (10%) and Spain (9%) [7].

A large variability concerning farm structures, endowment, labor force, and productivity are the main features of the EU agriculture, even at present, despite that the new member states adhered in different stages (2004, 2007, 2013). Most of farms have a small size and are typical semi-subsistence farms which reduce the speed of the land concentration mainly in the new member states [10, 11, 14,15, 17, 18].

The farm size varies from a country to another in a large scale from over 70 ha (Czechia, Slovakia, United Kingdom), between 50-70 ha (France, Germany, Denmark, Luxemburg), 25-50 ha (Ireland, Sweden, Finland, Netherlands, Belgium), 10-25 ha (Spain, Italy, Hungary, Portugal, Austria, Lithuania, Latvia, Bulgaria) and less than 10 ha (Poland, Romania, Greece, Slovenia, Croatia) [21].

More than 50 % of the agricultural area is worked by 3 % of the EU farms. The largest holdings with over 50 ha are concentrated in Luxembourg (52%), France (41%), United Kingdom (39%) and Denmark (35%) [3].

The Common Agricultural Policy has contributed to the development of agriculture stimulating the decline of the number of farms, the increase of farm size and its economic performance, the growth of the agricultural production value and GVA achieved in agriculture. Agricultural output is a result of the potential production factors (natural conditions, land, assets, human resources, applied technologies etc.) and the manner in which they are combined to assure a higher production, product quality, income and profit for farm managers. The highest potential in agricultural production is considered to belong to the Netherlands, Denmark, Luxembourg, the United Kingdom, Slovakia and Belgium [13].

The efficiency of the use of the agricultural area is one of the key factors having a substantial impact on the competitiveness of agriculture in the EU and on the volume, structure and quality of agricultural production. The EU enlargement and the applied agricultural policy programmes have favored the intensification of the agricultural output and tried to reduce the dissimilarities among the EU countries [2].

In this context, the objective of this study was to analyze the dynamics of the utilized agricultural land (ha UAA) in the EU-28 pointing out the differences among its member states regarding the surface used for agricultural purposes, the value of the agricultural production, the gross value added in agriculture, the efficiency of the use of agricultural land in terms of agricultural output and gross value added per ha UAA.

MATERIALS AND METHODS

Data collection

The data utilized in this study were collected from Eurostat Statistical Data base for the period 2009-2018. The period of ten years chosen in this research was considered to be able to diminish the impact of climate change on the level of indicators.

The following indicators have been taken into account at the level of the EU-28, and also by member state: (i)Utilized agricultural area (UAA), (ii)Value of agricultural production (VAP), (iii)Value of agricultural production per ha UAA, (iv)Gross value added in agriculture (GVA), (v)Share of GVA in VAP, and (vi)GVA per ha UAA.

Methods used for processing the data

Descriptive statistics was made using Excel facilities for the following indicators: UAA, VAP, VAP/ha UAA, GVA and GVA/ha UAA.

The statistical average and Standard deviation were of high importance in order to make the comparison among the EU member states regarding the level of these indicators. Therefore, the calculations were based on their well known formulas:

$$\bar{X}=\frac{\sum_{i=1}^{n} x_i}{n} \quad \text{and} \quad \delta^2\sqrt{\sum_{i=1}^{n}\frac{(x_i-\overline{X})^2}{n-1}}$$

where:

x_i= the values of the studied variable;

n=the number of items in the chronological series.

The Points Method was used to establish the rank of the EU countries based on the most important indicators reflecting the efficiency of the land use: VAP per ha UAA and GVA per ha UAA.

Also, Spearman rank-order correlation was estimated to prove the relationship between VAP/ha UAA and GVA/ha UAA, using the well known formula:

$$\rho = 1 - \frac{6\sum D^2}{N^3 - N}$$

where:

D= the difference of the ranks of the paired variables;

D^2 = the squared difference;

N= the items of the chronological series, more exactly, N=10, the decade 2009-2018.

The obtained results are presented in tables and graphics, of which just a part are included in this article.

RESULTS AND DISCUSSIONS

Utilized agricultural area

In the EU-28, the utilized agricultural area has slowly but continuously declined from 188.45 million ha in 2009 to 178.9 million ha in 2018, meaning a reduction of 5.07 % (Fig.1). Therefore, only 24.72 % of the EU surface is used for agriculture, despite that agricultural area accounts for about 48 %.

The average agricultural area utilized in the EU-28 in the analyzed decade was 179.78 million ha, meaning 6.42 million ha per a member state.

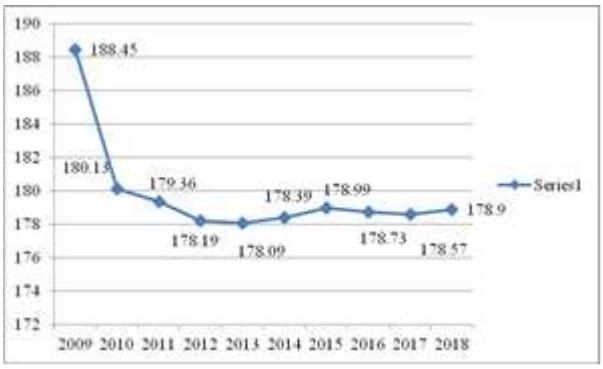

Fig.1. Dynamics of the utilized agricultural land in the EU-28 in the period 2009-2018 (Million ha)
Source: Own design and calculation based on [4].

The countries with a higher UAA than this mean of 6.42 million ha per country are: France, Spain, United Kingdom, Germany, Poland, Romania and Italy, all together summing 128.55 million ha, representing 71.46 % of the EU-28 UAA of 179.78 million ha. All the other countries used a smaller land area for agricultural purposes and as a result the share of their UAA in the European average is much lower (Table 1).

Therefore, there are large discrepancies regarding the UAA among the EU countries determined by the geographical position, relief forms, soil and climate conditions, agricultural systems and tradition in cultivating land.

The decline of the UAA at the EU-28 level was caused by the variations of UAA in each member state during the analyzed decade as shown in Table 2.

The figures show that there are no changes of the UAA in Spain, Luxemburg, Malta, Bulgaria and Denmark. In a few countries such as: Croatia, Lithuania, Cyprus, Estonia, Latvia, Slovenia and United Kingdom, the UAA was higher in 2018 compared to the 2009 level.

In most of the countries, the UAA declined in various proportions. The highest decrease, in the descending order, was noticed in France, Austria, Hungary, Poland, Greece, Netherlands, Italy and Portugal.

Table 1.The average agricultural utilized area in the period 2009-2018 by country of the EU-28

EU-28 UAA Average= 179.78 Million ha; Average UAA per member state= 6.42 Million ha					
Country	Average UAA, 2009-2018 Million ha	Share of the EU average %	Country	Average UAA, 2009-2018 Million ha	Share of the EU average %
Countries with over 6.42 Million ha UAA			Countries with less than 6.42 Million ha UAA		
1.France	29.66	16.49	8.Hungary	5.38	2.99
2.Spain	23.80	13.23	9.Greece	5.30	2.94
3.United Kingdom	17.28	9.61	10.Bulgaria	4.73	2.63
4.Germany	16.70	9.28	11.Ireland	4.50	2.50
5.Poland	14.61	8.12	12.Portugal	3.65	2.03
6.Romania	13.73	7.63	13.Czechia	3.51	1.95
7.Italy	12.77	7.10	14.Sweden	3.03	1.68
Total	128.55	71.46	15.Lithuania	2.87	1.59
			16.Austria	2.83	1.57
			17.Denmark	2.64	1.46
			18.Finland	2.27	1.26
			19.Slovakia	1.91	1.06
			20.Latvia	1.86	1.03
			21.Netherlands	1.83	1.01
			22.Croatia	1.38	0.76
			23.Belgium	1.33	0.73
			24.Estonia	0.96	0.53
			25.Slovenia	0.47	0.26
			26.Luxemburg	0.13	0.07
			27.Cyprus	0.11	0.06
			28.Malta	0.01	0.005

Source: Own calculation based on [4].

Table 2.The UAA variation by EU country, 2009-2018 (%)

Country	Percentage growth/decline, in 2018 vs. 2009 (%)	Country	Percentage growth/decline, in 2018 vs. 2009 (%)
1.France	-17.3	15.Ireland	-1.75
2.Spain	0	16.Greece	-6.37
3.United Kingdom	+1.1	17.Hungary	-7.62
4.Germany	-1.43	18.Bulgaria	0
5.Poland	-7.24	19.Portugal	-2.89
6.Romania	-1.55	20.Czechia	-0.60
7.Italy	-3.68	21.Sweden	-2.00
8.Croatia	+15.5	22.Lithuania	+9.7
9.Bekgium	-0.08	23.Austria	-16.14
10.Estonia	+7.50	24.Denmark	0
11.Slovenia	+2.10	25.Finland	-0.09
12.Luxemburg	0	26.Slovakia	-1.04
13.Cyprus	+1.33	27.Latvia	+5.46
14.Malta	0	28.Netherlands	-5.21

Source: Own calculation based on [4].

Value of agricultural production (VAP)

Agricultural production had in general an ascending trend, but it was disturbed by an inflexion in the period 2014-2016, when the economic accounts for agriculture showed that the EU-28 value of agricultural production stood at €405.0 billion at basic prices, being smaller by 2.8% compared to 2015 [1].

In the analyzed period, if we compare the level of 2018 versus the level of 2009, we may easily notice an increase. Thus, in the EU-28, the value of agricultural output increased by 26.53 % from Euro Billion 347.4 in 2009 to Euro Billion 435.8 in 2018 (Fig.2.)

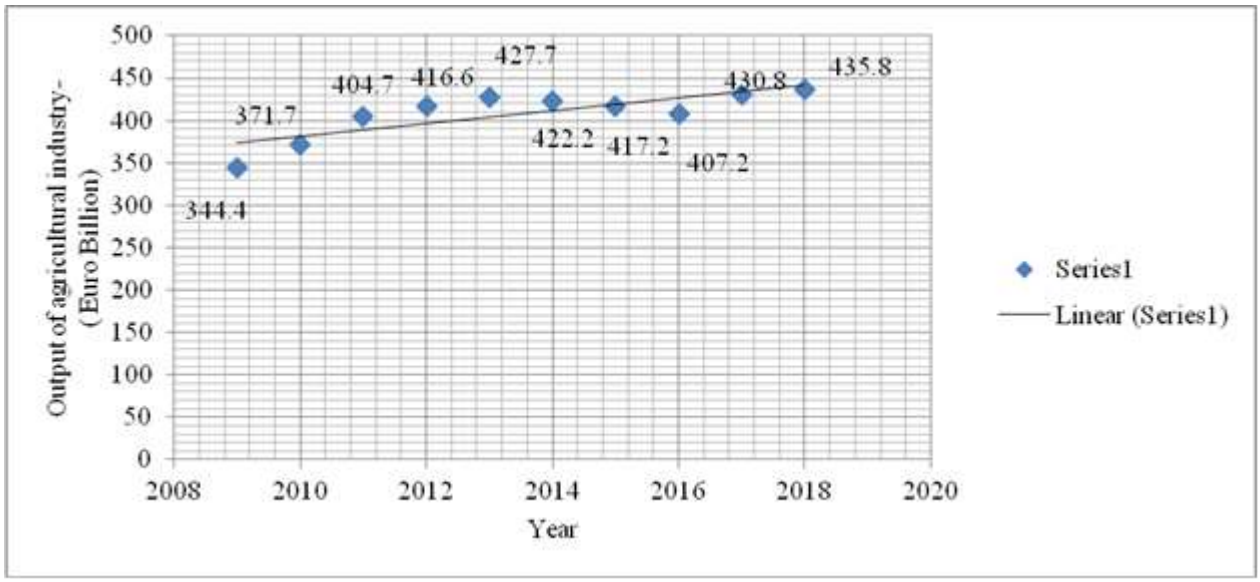

Fig.2.Dynamic of the agricultural production value, EU-28, 2009-2018 (Euro Billion)
Source: Own calculation and design based on [5].

However, Fig. 2 shows that in 2014, 2015 and 2016, the records regarding the value of agricultural output were lower than in the previous years. Of course, the level of agricultural production depends on many factors and their suitable combination: production organization and management, technological level, productivity, economies of scale, training level and skills of farm managers, but also on climate conditions which could favour or non favour agriculture [1].

The fact that agricultural output has a positive trend has contributed to the increase of agricultural sector in the EU economy. In 2018, the contribution of agriculture to EU GDP accounted for Euro Billion 183, representing 1.2 % of the whole GDP of the Community.

A positive aspect is the general ascending trend in the analyzed period noticed in almost all the EU countries, the highest growth being recorded by: Ireland, Lithuania, Latvia, Estonia, Hungary, Poland, Spain, Romania, Czechia and Luxemburg. However, in Croatia and Malta, the VAP declined in the last decade (Table 3).

Table 3.The percentage growth of the agricultural production value by country in 2018 vs.2009 (%)

EU-28 Growth rate= 26.53 %			
1.Ireland	+68.26	15.Slovenia	+23.80
2.Lithuania	+54.83	16.Netherlands	+23.55
3.Latvia	+52.32	17.Germany	+21.66
4.Estonia	+51.70	18. Portugal	+20.87
5.Hunagry	+50.70	19.Denmark	+19.52
6.Sweden	+44.20	20.France	+19.19
7.Poland	+42.21	21.Italy	+19.13
8.Spain	+40.72	22.Belgium	+16.59
9.Romania	+39.70	23.Cyprus	+10.60
10.Czechia	+39.18	24.Finland	+8.50
11.Luxemburg	+38.70	25.Bulgaria	+8.13
12.United Kingdom	+37.40	26.Greece	+5.39
13.Slovakia	+27.50	27.Malta	-0.08
14.Austria	+25.34	28.Croatia	-0.23

Source: Own calculation based on [5].

The value of agricultural production in the EU is given by the contribution of various sectors

operating in this field: 50.6 % coming from vegetal production (mainly from vegetables growing, fruit trees orchards and cereals cropping), 40.9 % from animal production (mainly dairy and pig farming) and 8.5 % from agricultural services.

The discrepancies regarding the contribution of the member states to the agricultural output of the EU is caused by the differences concerning agricultural production volume, crop and livestock [7].

The average agricultural production output at the EU level in the analyzed decade accounted for Euro Billion 408.83 with a standard deviation of 28.70 and a small variation coefficient of 7.03 %.

The average production value per member state was Euro Billion 14.46.

The countries which registered a higher average VAP over the EU-28 mean were: France, Germany, Italy, Spain, United Kingdom, Netherlands, Poland and Romania, all together summing 77.58 % share in the EU average agricultural output.

The smallest average VAP was carried out by Malta (Table 4).

Table 4. The average agricultural production value by EU country in the period 2009-2018 (Euro Billion)

EU-28 average VAP= Euro Billion 407.83; The average VAP per country = Euro Billion 14.56					
Country	Average VAP, Euro Billion	Share in the EU average VAP (%)	Country	Average VAP, Euro Billion	Share in the EU average VAP (%)
1.France	72.52	17.81	9.Greece	10.69	2.62
2.Germany	53.85	13.20	10.Denmark	10.43	2.55
3.Italy	53.62	13.14	11.Belgium	8.15	1.99
4.Spain	44.73	10.96	12.Hungary	7.64	1.87
5.United Kingdom	28.42	6.96	13.Ireland	7.08	1.73
6.Netherlands	26.92	6.60	14.Austria	6.91	1.69
7.Poland	22.51	5.52	15.Portugal	6.81	1.66
8.Romania	16.42	4.02	16.Sweden	5.92	1.45
Total	-	71.21	17.Czechia	4.71	1.15
			18.Finland	4.43	1.08
			19.Bulgaria	4.14	1.01
			20.Lithuania	2.69	0.65
			21.Croatia	2.46	0.60
			22.Slovakia	2.25	0.55
			23.Latvia	1.22	0.29
			24.Slovenia	1.18	0.28
			25.Estonia	0.81	0.19
			26.Cyprus	0.68	0.16
			27.Luxemburg	0.39	0.09
			28.Malta	0.12	0.02

Source: Own calculation based on [5].

In almost all the countries, the coefficient of variation for the value of agricultural production was below 10 %, except the following member states: Latvia (15.57 %), Lithuania (15.24%), Ireland (15.11 %), Croatia (14.83 %), Estonia (14.81%), Hungary (12.43%), and United Kingdom (12.10%).

Value of agricultural production per ha of utilized agricultural area

The VAP per ha UAA increased in the EU-28 by 33.27 % from 1,827 Euro/ha in 2009 to 2,435 Euro/ha in 2018 (Fig.3.) This growth was determined by the increased value of the agricultural production which had a positive effect, despite the decline of the UAA recorded in the most countries. The average value of VAP per ha UAA in the analyzed period accounted for 2,270 Euro/ha. The countries which recorded a higher value of the agricultural output per ha UAA in this interval, in the decreasing order, have been: Malta, Cyprus, Belgium, Italy, Denmark, Germany, Luxemburg, Slovenia, Austria and France (Table 5).

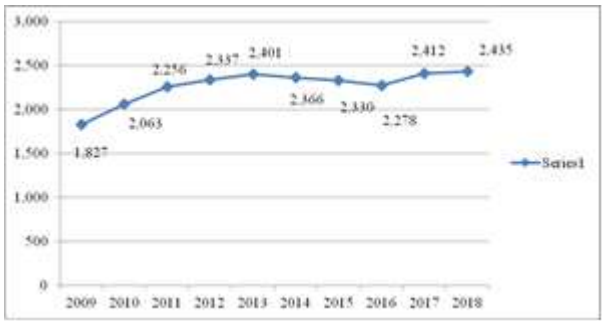

Fig.3.Dynamics of agricultural production value per ha utilized agricultural production (Euro/ha)
Source: Own calculation and design based on [4, 5].

Taking into account the top seven countries with the largest UAA, one may easily notice that the efficiency of the land use in terms of the value of agricultural production per ha UAA is the highest only in Italy, Germany and France, which are able to exceed the EU-average VAP per ha UAA of Euro 2,270.
Spain is situated on the 2nd position for UAA and on the 14th position for VAP/ha UAA. United Kingdom occupying the 3rd position for UAA is on the 17th position for VAP/ha UAA. Poland ranked the 5th for UAA is on the 19th position for VAP/ha UAA. Romania ranked the 6th for its UAA is on the 23rd position for VAP/ha UAA.
However, Malta, Cyprus, Belgium, Denmark, Luxemburg, Slovenia and Austria which occupied the 28th, 27th, 23rd, 17th, 26th, 25th and 16th positions for the UAA are among the top 10 countries with the highest VAP per ha UAA reflecting a high efficiency of the land use in the analyzed decade.

Table 5. The average VAP per ha UAA by country in the EU-28 in the decade 2009-2018 (Euro/ha)

EU-28 average VAP per ha UAA = 2,270 Euro					
Country	Average VAP/ha UAA Euro/ha	Share in the EU average VAP/ha (%)	Country	Average VAP/ha UAA Euro/ha	Share in the EU average VAP/ha (%)
1.Malta	12,010	+428.0	15.Portugal	1,865.5	-17.8
2.Cyprus	6,078.3	+167.7	16.Croatia	1,817.4	-20.0
3.Belgium	5,431.9	+139.2	17.United Kingdom	1,651	-27.3
4.Italy	4,190	+84.5	18.Ireland	1,576	-30.6
5.Denmark	3,951	+74.0	19.Poland	1,543	-32.1
6.Germany	3,223.6	+42.0	20.Netherlands	1,466.4	-35.5
7.Luxemburg	2, 999.3	+32.1	21.Hungary	1,423	-27.4
8.Slovenia	2,521.8	+11.09	22.Czechia	1,342.9	-40.9
9.Austria	2,460	+8.37	23.Romania	1,195	-47.4
10.France	2,458	+8.28	24.Slovakia	1,153.8	-49.1
11.Greece	2,018	-11.2	25.Lithuania	933	-58.9
12.Sweden	1,957.6	-13.8	26.Estonia	840.5	-63.0
13.Finland	1,950.5	-14.1	27.Bulgaria	823	-63.8
14.Spain	1,878	-17.3	28.Latvia	654.4	-71.2

Source: Own calculation based on [4, 5].

Gross value added in agriculture

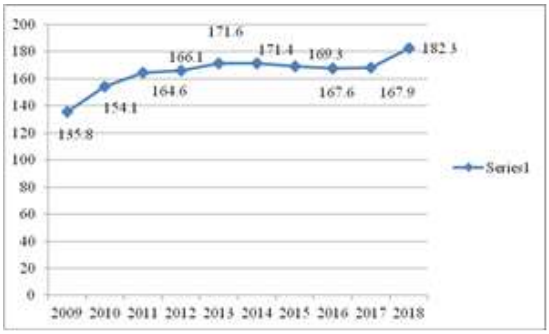

Fig.4. Dynamics of GVA achieved in the EU-28 agriculture, 2009-2018 (Euro Billion)
Source: Own calculation and design based on [6].

The gross value added (GVA) created in the EU-29 agriculture increased by 34.2 % from Euro Billion 135.8 in the year 2009 to Euro Billion 182.3 in 2018 (Fig. 4).
The average GVA obtained in the agriculture of the EU accounted for Euro Billion 167, meaning Euro Billion 5.96 in average per member state. The countries which exceeded the average GVA per country have been the following ones: Italy, France, Spain, Germany, United Kingdom, Netherlands, Poland and Romania (Table 6).

Table 6. The average GVA by country in the EU-28 in the decade 2009-2018 (Euro Billion)

EU-28 average GVA = Euro Billion 167; the EU average GVA per member state= Euro Billion 5.96					
Country	Average GVA UAA, 2009-2018 Euro Billion	Share in the EU average GVA per country (%)	Country	Average GVA UAA, 2009-2018 Euro Billion	Share in the EU average GVA per country (%)
1.Italy	30.27	+407.8	15.Ireland	2.00	-66.5
2.France	28.23	+373.6	16.Bulgaria	1.63	-72.7
3.Spain	24.21	+306.2	17.Sweden	1.60	-73.2
4.Germany	17.81	+198.8	18.Czechia	1.37	-77.1
5.United Kingdom	10.20	+71.1	19.Finland	1.23	-79.4
6.Netherlands	9.87	+65.6	20.Croatia	1.08	-81.9
7.Poland	8.71	+46.1	21.Lithuania	0.96	-83.9
8.Romania	7.10	+19.1	22.Slovakia	0.52	-91.3
9.Greece	5.42	-9.1	23.Slovenia	0.44	-92.7
10.Hungary	2.90	-51.4	24.Cyprus	0.30	-95.0
11.Austria	2.82	-52.7	25.Latvia	0.29	-95.2
12.Denmark	2.61	-56.3	26.Estonia	0.26	-95.7
13.Portugal	2.54	-57.4	27.Luxemburg	0.10	-98.4
14.Belgium	2.25	-62.3	28.Malta	0.05	-99.2

Source: Own calculation based on [6].

Greece is situated below the EU average GVA per country, but close to this figure, all the othre countries registered a lower GVA.

However, the GVA growth in the EU agriculture is a consequence of its increase in the member states. The highest GVA growth rate was recorded in Ireland, Hungary, Czechia, Slovakia, but also in Lithuania, Estonia, Slovenia, France, United Kingdom and Spain (Table 7).

Table 7. The growth rate of GVA by EU country in 2018 vs. 2009 (%)

EU-28 GVA Growth rate= 34.2 % in 2018 vs.2009 (%)			
1.Ireland	+215.8	15.Bulgaria	+34.80
2.Hungary	+119.76	16.Romania	+30.20
3.Czechia	+119.4	17.Germany	+27.43
4.Slovakia	+103.4	18. Sweden	+23.30
5.Lithuania	+54.23	19.Italy	+22.54
6.Estonia	+47.05	20.Latvia	+20.00
7.Slovenia	+44.7	21.Cyprus	+16.66
8.France	+44.51	22.Portugal	+14.62
9.United Kingdom	+44.29	23.Denmark	+11.78
10.Spain	+44.05	24.Belgium	-3.60
11.Austria	+40.44	25.Greece	-4.61
12.Poland	+39.94	26.Malta	-16.70
13.Netherlands	+38.14	27.Finland	-21.70
14.Luxemburg	+37.50	28.Croatia	-29.40

Source: Own calculation based on [6].

A number of five countries: Croatia, Finland, Malta, Greece and Belgium registered a decline of GVA in various proportions in the analyzed period.

The share of gross value added in the value of agricultural production

Taking into account the GVA and VAP at the EU level, the share of GVA in VAP increased from 39.09 % in 2009 to 41.83 5 in 2018. The average share in the analyzed decade was 40.95 % in the EU-28 (Fig. 5).

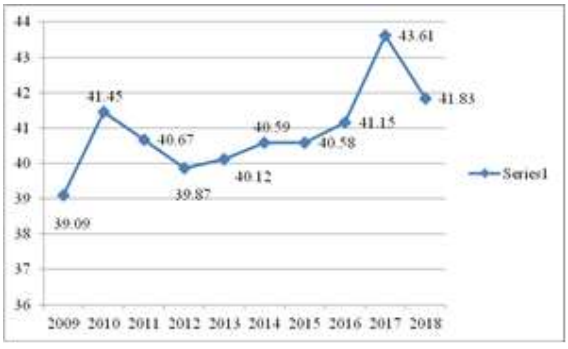

Fig.5.The share of GVA in VAP, the EU-28, 2009-2018 (%)

Source: Own calculation based on [5, 6].

The data from Table 8 show that the countries exceeding the EU-28 weight of GVA in VAP of 40.95 % have been: Italy, Spain, Greece, Cyprus, Croatia, Romania and Malta, which are followed by Austria, Bulgaria, France, Poland, Hungary, Portugal, Slovenia, Netherlands, United Kingdom, Lithuania and Germany.

Table 8. The share of gross value added in the value of the agricultural output by country in the period 2009-2018 (%)

The share of GVA in VAP in the EU-28 = 40.95 %			
Country	Share of GVA in VAP (%)	Country	Share of GVA in VAP (%)
1.Italy	56.45	15.Netherlands	36.66
2.Spain	54.12	16.United Kingdom	35.89
3.Greece	50.70	17.Lithuania	35.68
4.Cyprus	44.11	18. Germany	33.07
5.Croatia	43.90	19.Estonia	32.09
6.Romania	43,23	20.Czechia	29.08
7.Malta	41.66	21.Ireland	28.24
8.Austria	40.81	22.Finland	27.76
9.Bulgaria	39.37	23.Belgium	27.60
10.France	38.92	24.Sweden	27.02
11.Poland	38.69	25.Luxemburg	25.64
12.Hungary	37.95	26.Denmark	25.00
13.Portugal	37.29	27.Latvia	23.77
14.Slovenia	37.28	28.Slovakia	23.11

Source: Own calculation based on [5, 6].

Gross value added per ha of utilized agricultural area

In the EU-28, the GVA per ha UAA accounted for Euro 1,019 in the year 2018, being by 41.33% higher than in 2009 (Euro 721) (Fig.6).

Fig.6.The share of GVA in the UAA, EU-28, 2009-2018 (Euro/ha UAA)
Source: Own calculation based and design on [4, 6].

The EU average GVA per ha UAA in the analyzed decade was 671.1 Euro/ha. A number of 15 countries carried out a higher GVA per ha UAA than the EU average. The top countries regarding the GVA per ha UAA are the ones where the agricultural land is used with high efficiency.

In the decreasing order, their hierarchy is the following one: Malta, Netherlands, Cyprus, Italy, Belgium, Germany, Greece, Spain, Austria, Denmark, Slovenia, France, Luxemburg, Croatia and Portugal. Other countries recorded a GVA per ha UAA below the EU average level (Table 9).

The GVA per UAA increased in the most of the EU countries with a few exceptions. The highest growth was recorded in Ireland, Hungary, Czechia, Slovakia, France, Austria, Poland, Luxemburg, Netherlands and Spain.

But, there are also countries where GVA per ha UAA was lower in 2018 compared to the level achieved in 2009. It is about: Croatia (-40%), Finland (-26.18%), Malta (-5.62%) and Belgium (-3.17).

The countries with a higher growth rate of GVA per ha UAA than the EU-28 growth rate of 41.33 % in the interval 2008-2009 have been: Ireland, Hungary, Czechia, Slovakia, France, Austria and Poland (Table 10).

Table 9. The average GVA per ha UAA by EU country in the period 2009-2018 (Euro/ha UAA)

The EU-28 average GVA per ha UAA = 671.1 Euro/ha					
Country	Average GVA per ha UAA Euro/ha	Share in the EU average GAV/ha (%)	Country	Average GVA per ha UAA Euro/ha	Share in the EU average GAV/ha (%)
1.Malta	5,848	871.4	15.Portugal	696.9	103.8
2.Netherlands	5,377.7	801.3	16.Poland	597.8	89.07
3.Cyprus	2,762.5	411.6	17.United Kingdom	590.6	88.00
4.Italy	2,375	353.8	18.Finland	545	81.20
5.Belgium	1,685.6	251.1	19.Hungary	543.5	80.98
6.Germany	1,066.7	158.9	20.Sweden	530.7	79.07
7.Greece	1,025.5	152.8	21.Romania	517.9	77.17
8.Spain	1,017.1	151.5	22.Ireland	459.8	68.51
9.Austria	1,008.3	150.2	23.Czechia	440.6	65.65
10.Denmark	988	147.2	24.Lithuania	334.8	49.88
11.Slovenia	967.3	144.1	25.Bulgaria	326.1	48.59
12.France	958.6	142.8	26.Slovakia	310.8	46.31
13.Luxemburg	809.4	120.5	27.Estonia	281.5	41.94
14.Croatia	796	118.6	28.Latvia	161.2	24.02

Source: Own calculation based on [4, 6].

Table 10. The growth rate of the GVA per ha UAA by country in the EU-28, 2009-2018 (%)

EU-28 growth rate of the GVA per ha UAA in 2018 vs.2009 = 41.33 %			
Country	GVA growth rate (%)	Country	GVA growth rate (%)
1.Ireland	+220.30	15.Bulgaria	+34.10
2.Hungary	+137.10	16.Latvia	+33.67
3.Czechia	+120.00	17.Romania	+32.26
4.Slovakia	+106.25	18. Germany	+30.55
5.France	+74.73	19.Italy	+27.20
6.Austria	+67.72	20.Sweden	+26.08
7.Poland	+50.90	21.Portugal	+18.05
8.Luxemburg	+47.44	22.Denmark	+12.24
9.Netherlands	+45.66	23.Cyprus	+6.06
10.Spain	+43.99	24.Greece	+1.90
11.United Kingdom	+43.94	25.Belgium	-3.17
12.Lithuania	+41.17	26.Malta	-5.62
13.Slovenia	+40.11	27.Finland	-21.18
14.Estonia	+34.95	28.Croatia	-40.00

Source: Own calculation based on [4, 6].

Table 11.The rank occupied by the EU countries based on VAP/ha UAA and GVA/ha UAA

Country	Rank	Country	Rank
1.Malta	1	15.Croatia	10
2.Cyprus	2	16.Finland	11
3.Belgium	3	17.Sweden	12
4.Italy	3	18.United Kingdom	13
5.Germany	4	19.Ireland	14
6.Denmark	5	20.Poland	14
7.Austria	6	21.Hungary	14
8.Greece	6	22.Romania	15
9.Slovenia	7	23.Czechia	16
10.Luxemburg	8	24.Lithuania	17
11.France	9	25.Slovakia	18
12.Spain	9	26.Bulgaria	19
13.Netherlands	9	27.Estonia	20
14.Portugal	10	28.Latvia	21

Source: Own calculation.

The rank occupied by the EU-countries based on the two land use efficiency indicators: VAP/ ha UAA and GVA/ha UAA

From this point of view, the countries with the highest economic efficiency of the utilization of the agricultural land are: Malta, Cyprus, Italy, Belgium, Germany, Denmark, Austria, Greece, Slovenia, Luxemburg, France, Spain, Netherlands, Portugal and Croatia. They are situated in the top of the hierarchy based on these two important indicators reflecting the efficiency of the land use.

The countries with the lowest efficiency of the land utilization in agriculture are Latvia, Bulgaria, Estonia, Lithuania and Slovakia (Table 11).

Spearman rank-order correlation

Using the ranks belonging to each country for the two key indicators reflecting the efficiency of the utilized agricultural land, the value of Spearman rank-order correlation was $r_S = 0.838$, reflecting a very strong relationship between the VAP and GVA per ha UAA, as it was expected, because, gross value added is a part of the agricultural production value.

CONCLUSIONS

The results of the research reflected a different degree of the efficiency in the utilization of the agricultural land among the EU countries.

This was determined by many factors among which the most important ones are: the geographic position on the EU map, the local conditions concerning relief, soil structure, characteristics, fertility, climate features regarding temperatures, precipitations regime, extreme phenomena (drought, floods, a.s.o.), the existence/non existence of irrigation systems, the technical endowment for working the land, the applied technologies, labor force qualification, experience in agriculture, land management, farm management, EU enlargement, the implementation of the Common Agricultural Policy in each country etc.

Despite of this large variety existing between the countries regarding the lad use efficiency, it was noticed a slight process of convergence grace to the strong CAP sustaining and stimulating farmers to improve, balance and optimize the combination of the production factors. The subsidies allotted per ha are of high importance in this respect.

The study proved that the efficiency of the land use in agriculture could be approached from many points of view and that the key indicators reflecting that in a country the agricultural land is higher or lower efficiently utilized are agricultural production and gross value added per ha of the UAA. The efficiency of a used ha in agriculture is reflected by how much agricultural production and gross value added is obtained. Therefore, farmers have to strengthen their efforts to find the best solutions to assure the optimization of the land use in combination with all the other production factors in order to grow agricultural production and gross value added per utilized ha, that is to make land use more efficient in the EU agriculture.

The Common Agricultural Policy is continuously reforming and adapting to the new challenges agriculture is facing. It keeps pace with the advanced results in agricultural sciences and technological progress and establish further changes for the prospect 2020 in order to increase the efficiency of the production factors (land, capital, labour, knowledge and entrepreneurship) in agriculture, agricultural production value and gross value added, to satisfy much better the needs of the EU population for food and improve farmers' income and living standard.

This study is just a beginning in studying efficiency of the land use, and further researchers will take into account many other factors which could raise the efficiency of agricultural land management.

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