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EFFICIENCY OF LABOR FORCE USE IN THE EUROPEAN UNION'S AGRICULTURE IN THE PERIOD 2011-2020

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Abstract

The paper aimed to analyze the efficiency of labor force input in the EU using the most representative indicators: agricultural production and gross value added per 1,000 AWU and also of Factor A in the decade 2011-2020. The applied methodology included fixed basis index in 2020 vs 2011, average annual growth rate in the interval, and market share. In the period 2011-2020, the EU agricultural output value and gross value added have definitely increased, accounting for Euro 411.77 Billion and, respectively, Euro 176,96 Billion in 2020, while labour input continued to decline reaching an employment rate of 4.37%. In 2020, the EU agricultural output value per 1,000 AWU accounted for Euro 60 Million while GVA for Euro 20.83 Million. While Denmark, Netherlands, Belgium, Luxembourg, Germany, Sweden, France are in the top compared to the EU average for agricultural output per AWU, Latvia, Bulgaria, Slovenia, Poland, Croatia and Romania are situate in the opposite corner. Compared to the EU average of Euro 20.83 Million for GVA/1,000 AWU, Netherlands, Denmark, France, Germany are on the top positions, while Bulgaria, Latvia, Slovenia, Croatia, Poland and Romania are on the last positions. Indicator A or Factor income reached 124% in 2020 being by 24% higher than in 2010. The highest Indicator A belongs to Bulgaria and Hungary, while the lowest one to Germany, Austria, Finland, Netherlands and Belgium. In conclusion, the efficiency of the use of labour force differs from an EU member state to another depending on its efforts to increase net gross value and decrease labour input. Only the growth of agricultural output, the optimization of intermediate consumption, the raise of net GVA, the decline in labor input but using only a high qualified, conscious, responsible, workable labor force and taking measures to face the climate change, the EU could grow the labour productivity.

Key words**:** *efficiency, labor force use, agriculture, productivity, European Union*

INTRODUCTION

The EU and the USA are the most important players in the world agricultural market and the competition between these two economic powers becomes stronger year by year [16, 17].

As a primary sector of the EU economy, agriculture is the key provider of raw materials for food processing industry and whose noble purposes are to nourish the population and assure its food security, to bring incomes and welfare to farmers and their families and to contribute to the environment protection and biodiversity conservation and also to sustain its export of agro-food products.

Despite that the EU agriculture is dominated by millions of small-sized farms, most of them being family farms, farming is still a big deal taking into account its purposes as mentioned above [39].

Agricultural production value and gross value added have increased in the EU, but still there are huge differences between the member states [32, 33].

More than this, even thou the contribution to the EU GDP is only 1.3% compared to other economic branches, in various member states the importance of agriculture in the economy

is different reflected in terms of agricultural output value, gross value added and intermediate consumption etc. according to the peculiarities of the local geographical, economic, social, and environment conditions [23, 24, 25, 26, 27].

In general, during the last decades it was noticed the decline in the agriculture's contribution to GDP, the decrease of the number of employed persons, and the productivity growth in the EU countries [1, 28, 31, 36].

The results obtained in agriculture are due to the use of agricultural land and technologies applied, and to the efficiency how human, fixed and working capital are utilized [18, 19, 20, 35, 37].

Human capital is the most precious resource, the main driver in producing food and in the EU rural areas the population is still high, with large variations from a country to another, and agriculture is still the main business providing income and assuring the living standard for the local population [13, 21, 22, 40].

The EU agricultural labor force in the EU varies from a member state to another. Significant differences between the Northern and Central regions and the Eastern and Mediterranean regions were found regarding labour force and productivity taking into consideration various agricultural systems applied in the EU countries [11, 41, 42, 43].

The results obtained by [12] proved that in the old EU member states there is no sigma, but beta divergence in labour productivity which is statistically significant, while in the new member states both sigma and beta convergence coexists.

In terms of gross value added per employed person, labour productivity still reflects large discrepancies among the EU countries but the gap is slowly declining [14, 45].

However, the general tendency is the decreasing trend of number of persons involved in agricultural activities, which on one side is a positive aspect, as it contributes to the improvement of labor productivity and farm size, but on the other side, it is a negative aspect as it is caused by farmers' ageing and rural population especially of the young people's migration to urban areas or abroad [38].

More than this in the EU labor force input has a large diversity referring to form of employment (full time or part time), source of getting income (salaried and nonsalaried), age and gender structure, training level, and productivity [29, 30].

The impact of the new CAP on the dynamics of agriculture could not be evaluated without taking into consideration the structural changes in labor productivity in close relationship with the environmental exigencies for a sustainable development [3].

CAP subsidies increase agricultural labour productivity, due especially to the decoupled Pillar I payments and the mixed impact of Pillar II [10].

Despite of the decline of Total Factor Productivity (TFP) dynamics in the EU member states in the period 2003-2014, there is still a gap between productivity in the new states compared to the old ones, but also a slight productivity convergence [2, 15].

At present in the EU, labor productivity is measured by an index named "Factor A expressing the net value added by the equivalent of each full time worker dealing with agriculture" as defined by Eurostat [6]. Its level is deeply influenced by its two determinants:

-net value added, which is gross value added adjusted for the consumption of the fixed capital and subsidies and taxes for production;

-agricultural labor input in terms of annual work unit (AWU), meaning the equivalent of full time worker in the agricultural sector.

While gross value added and, respectively, net value added produced in agriculture is increasing, agricultural labor input has a general declining trend [4].

In this context, the paper aimed to analyze the efficiency of labor force input in the EU in terms of agricultural production and gross value added per 1,000 AWU and also in terms of Factor A as the key index reflecting labor productivity. The selected period of the study was 2011-2020, and the level of the main indicators involved in this research were comparatively studied in 2020 versus 2011 both at the EU level and by each member

state. Finally, a few proposals were issued regarding how to increase the efficiency of labor force use in the EU agriculture, more exactly of labor productivity.

MATERIALS AND METHODS

This research is based on the data provided by Eurostat data and Reports, and also on the results presented by the literature on the topic.
The following aspects have been approached:
-agriculture as a big employer in the EU, emphasizing total labor force input and its structure by salaried and non salaried persons;
-agriculture performance in terms of agricultural output value and gross value added;
-economic efficiency of the use of labor force in agriculture in terms of three indicators; agricultural output value per 1,000 AWU, gross value added per 1,000 AWU and Factor A- as real income by the equivalent of each full-time worker in the agricultural industry.
All these aspects were presented at the EU level and by each member state.

The study period was 2011 - 2020, but the results shown in this study regards only the changes in 2020 versus 2011, using as methodological procedures: fixed index in 2020 vs 2011, average annual growth rate in the whole interval, and structural indices like market share.
More than this, based on the results for each studied indicator, the EU member stated have been classified establishing their hierarchy in comparison with the EU average.
The obtained results were displayed in tables and graphics, being accompanied by the corresponding comments and at the end of the study there were drawn the main conclusions.

RESULTS AND DISCUSSIONS

Agriculture - a big EU employer

Agriculture still is the big employer in the EU economy, despite that in the interval 2011-2019 the employment rate declined from 5.6% in 2011 to 4.37% in 2019 [44].

Table 1. Total labor force input in the EU's agriculture, in 2020 versus 2011

	2020 (1,000 AWU)	2020 vs 2011 % 2011= 100	2020 Market share (%)
EU	**8,494.35**	**-15.9**	**100.00**
Belgium	54.73	-5.0	0.64
Bulgaria	178.0	-52.4	2.10
Czechia	102.02	-4.0	1.20
Denmark	52.13	+0.1	0.61
Germany	465.0	-10.2	5.47
Estonia	17.72	-27.3	0.20
Ireland	160.7	-3.0	1.89
Greece	405.9	-9.7	4.77
Spain	784.56	-13.2	9.23
France	720.26	-10.0	8.47
Croatia	176.38	-11.4	2.09
Italy	1,084.2	-5.5	12.76
Cyprus	20.87	-17.9	0.24
Latvia	68.78	-22.1	0.80
Lithuania	127.59	-10.6	1.50
Luxembourg	3.4	-7.4	0.04
Hungary	337.6	-22.8	3.97
Malta	5.04	+5.7	0.05
Netherlands	153.76	+1.3	1.81
Austria	113.83	-10.0	1.34
Poland	1,675.8	-12.5	19.72
Portugal	221.34	-26.1	2.60
Romania	1,331.0	-13.2	15.66
Slovenia	76.46	-2	0.90
Slovakia	42.2	-26.5	0.49
Finland	60.4	-25.7	0.71
Sweden	53.68	-16.4	0.63

Source: Own calculation based on the data from [5].

In 2020, the total labor force input in the EU accounted for 8,494.35 (1,000 AWU), meaning by 15.6% less than in 2011, where there were 10,99.8 (1,000 AWU).

Of the total labor force input, about 24% are salaried person and the difference are non-salaried employees.

The fact that agriculture needs an important labor force input is justified by the complexity of the agricultural activities both in the vegetal and animal sector, the seasonality of the technological processes, farm structures, technical endowment, soil and climate conditions which varies from a member state to another.

The general trend in the most of the EU countries is a decreasing one in various proportions which varies from a member state to another.

In the period 2011-2020, the highest decline was noticed in Bulgaria (-52.4%, Estonia -27.3%, Latvia -22.1%, Hungary -22.8%, Portugal -26.1%, Slovakia -26.5% and Finland -25.7%.

The smallest decline was recorded by Slovenia - 2% and Ireland -3%.

A few states registered an increase of labor force input in agriculture like: Denmark +0.1%, Malta +3.7% and Netherlands +1.3%.

In 2020, the highest percentage of labor force input in terms of AWU was recorded in Poland 19.72%, Romania 15.66%, Italy 12.76%, Spain 9.23%, France 8.47%, Greece 4.77%, and Hungary 3.97%. The first four countries accounted for 57.37% of the EU labor force input in agriculture and together with the last three they accounted for 74.58% (Table 1).

The main economic effects of the use of labour force input in the EU agriculture

Discussing about agriculture, it is worth to point out its role in the economy, assuring raw materials for processing industry, food security for the population, and giving its contribution to GDP, export, trade and payment balance.

This cannot be achieved without the contribution of the labour force which is one of the key production factors.

Despite that the number of people working in agriculture has a general declining trend, agricultural production value and GVA created in agriculture have continuously increased with a few inflexions in specific years in close relationship with the negative effects of the climate change.

Of course, we have not to deny the social effects of agriculture development, which is still the main sector in the rural areas providing jobs and income, and also contributing to the living standard and welfare of the local population.

More than this, agriculture development nowadays is closely related to the capacity of adaptation to climate change, and environment protection and biodiversity preservation.

In this paper there are approached only the economic effects of the use of labour force in terms of agricultural output and gross value added.

Output value in agricultural industry

In the analyzed period, 2011-2020, the value of agricultural industry output increased by 1.89% from Euro 404 Billion in 2011 to Euro 411.77 Billion in 2020. This was due to the high efforts made by all the member states to diversify production, improve the production structure and raise its volume and quality.

However, among the member states there are differences regarding the growth rate in agricultural industry. The highest growth rate in 2020 versus 2021 was recorded by Latvia +55.4%, Ireland +33.2%, Lithuania +33.85, Luxembourg +25.5% and Estonia +20.2%. The lowest growth rate was noticed in Malta +0.7% and Slovakia +1.4%.

In a few countries, agricultural output declined by -10.8% in Croatia, -9.5% in Bulgaria, -6.7% in Romania and -2.6% in Finland.

In consequence, the contribution of the member states to the EU-28 agricultural output value varied from a country to another, the highest contribution being given by France 18.31%, Germany 13.79%, Italy 13.07%, Spain 12,85%, Netherlands 6.89%, Poland 6.60%, Romania 4.08%, all together summing 76.15% of the EU agricultural output (Table 2).

Table 2. EU agricultural output value and gross value added in 2020 versus 2011

	Agricultural output value			Gross value added		
	2020 (Euro Million)	Change 2020 vs. 2011 (%)	Market share in 2020 (%)	2020 (Euro Million)	Change 2020 vs. 2011 (%)	Market share in 2020 (%)
EU	**411,772.2**	**+1.89**	**100.0**	**176,966.93**	**+7.27**	**100.0**
Belgium	8,661.4	+2.7	2.10	2,275.13	+8.00	1.28
Bulgaria	3,964.6	-9.5	0.96	1,663.15	+1.80	0.93
Czechia	5,494.8	+13.6	1.33	1,845.28	+28.0	1.04
Denmark	11,089.7	+3.2	2.69	2,961.08	+5.90	1.67
Germany	56,804.2	+2.1	13.79	20,257.3	+2.20	11.64
Estonia	974.3	+20.2	0.24	242.03	-22.00	0.13
Ireland	8,763.2	+33.2	2.12	3,086.87	+65.10	1.74
Greece	11,813.9	+11.3	2.86	6,144.42	+13.40	3.47
Spain	52,919.3	+29.1	12.85	29,287.97	+37.80	16.54
France	75,428.1	+3.2	18.31	30,182.49	+3.60	17.05
Croatia	2,552.7	-10.8	0.62	1,254.60	-3.30	0.70
Italy	56,320.4	+7.4	13.67	31,448.59	+9.30	17.77
Cyprus	760.6	+7.7	0.18	340.25	+4.50	0.19
Latvia	1,681.7	+55.4	0.40	591.98	+128.38	0.33
Lithuania	3,461.2	+33.8	0.84	1,6503.72	+66.94	0.84
Luxembourg	438.8	+25.5	0.11	124.60	+38.30	0.07
Hungary	8,464.5	+9.1	2.05	3,647.14	+26.10	2.06
Malta	127.2	+0.7	0.03	62.04	+7.60	0.03
Netherlands	28,235.5	+8.5	6.85	10,574.15	+24.70	5.97
Austria	7,712.5	+7.7	1.87	3,241.37	+5.50	1.83
Poland	27,177.7	+19.5	6.60	11,045.32	+23.30	6.24
Portugal	7,829.1	+19.6	1.90	2,912.23	+22.40	1.64
Romania	16,847.0	-6.7	4.08	7,921.71	-2.40	4.47
Slovenia	1,353.3	+10.2	0.32	603.27	+27.9	0.34
Slovakia	2,329.4	+1.4	0.56	677.12	+7.90	0.32
Finland	4,463.0	-2.6	1.08	1,430.88	+13.50	0.80
Sweden	6,103.0	+3.1	1.48	1,742.22	+2.50	0.90

Source: Own calculation based on the data from [7, 8].

The performance in agricultural production value at the EU level was carried out by the contribution of the three subsectors or activity: vegetal sector 52.8%, animal sector 38.6% and service sector 8.6%.

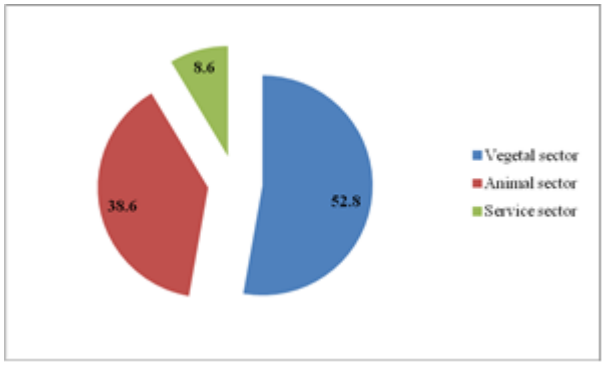

Fig. 1. The contribution of the subsectors to the EU agricultural output value in 2020 (%)
Source: Own design based on the data from [9].

Gross value added in agricultural industry

At the EU level, in the agricultural industry, gross value added increased by 7.27% in the analyzed interval, in the last year 2020 accounting for Euro 176,966.93 Million, representing 42.98% of the agricultural output value.

The differences of 57.02% being represented by the value of the intermediate consumption, that is of the inputs required involved in the production process, adjusted for taxes and subsidies on products (Fig. 2).

Therefore, making a calculation, we may notice that in 2020, at the EU level, one Euro spent on intermediate consumption (goods and services involved in agricultural production process) produced Euro 0.75 value added.

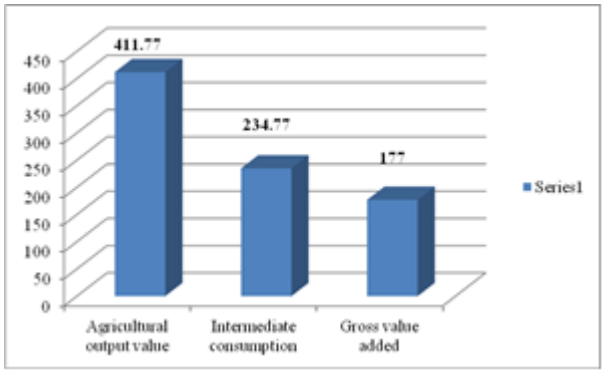

Fig. 2. EU agricultural production output value, intermediate consumption and gross value added in 2020 (Euro Billion)
Source: Own design based on the data from [9].

Most of the member states registered a higher GVA in 2020, with a few exceptions.
The highest growth rate was recorded by Latvia +128.38%, Lithuania +66.94%, Ireland +65.15 and the lowest growth rate by Bulgaria 1.8%.

Compared to 2011, a few countries registered a decline in GVA in 2020 as follows: Estonia -22%, Croatia -3.3% and Romania -2.4%.
The highest contribution to the EU GVA in agriculture was given in 2020 by Italy 17.77%, France 17.05%, Spain 16.54%, Germany 11.44%, Poland 6.24%, Netherlands 5.97%, Romania 4.475, Greece 3.47%, all together accounting for 82.95% (Table 2).

Economic efficiency of the labor force use in the EU agriculture

In this respect, there are many alternatives to quantify the economic efficiency of the use of labor force in agriculture: agricultural output value per 1,000 Annual Work Unit (AWU), gross value added per 1,000 AWU and factor income as a measure of net value added by the equivalent of each full-time worker in real terms adjusted for inflation and expressed as an index [4].

Table 3. Agricultural output value and gross value added per 1,000 AWU in the EU countries in 2020 versus 2011

	Agricultural output value Euro Million/1,000AWU			**Gross value added Euro Million/1,000 AWU**		
	2020 (Euro Million/1,000 AWU)	**Change 2020 vs. 2011 (%) 2011=100**	**Average annual growth rate, 2011-2020 (%)**	**2020 (Euro Million/1,000 AWU)**	**Change 2020 vs. 2011 (%) 2011=100**	**Average annual growth rate, 2011-2020 (%)**
EU	**60.2**	**+25.5**	**2.5**	**20.83**	**+27.5**	**2.7**
Belgium	158.2	+14.4	1.5	41.57	+13.7	1.4
Bulgaria	22.1	+90.5	7.4	9.29	+114.0	8.8
Czechia	53.9	+18.4	1.8	18.08	+33.3	3.2
Denmark	212.7	+3.1	0.3	56.80	+5.7	0.6
Germany	122.1	+13.2	1.3	93.56	+13.8	1.4
Estonia	55.0	+65.6	5.7	13.65	+7.3	0.7
Ireland	54.5	+37.2	3.5	19.20	+70.2	6.0
Greece	29.1	+23.3	2.3	15.13	+25.5	2.5
Spain	67.4	+48.7	4.5	37.33	+58.7	5.2
France	104.7	+14.6	1.5	41.90	+15.1	1.5
Croatia	14.5	+0.69	0.06	7.11	+9.2	0.9
Italy	51.9	+13.5	1.4	29.00	+15.6	1.6
Cyprus	36.4	+30.9	3.0	16.30	+27.2	2.7
Latvia	24.4	+100.0	8.0	8.60	+193.5	12.7
Lithuania	27.1	+49.7	4.5	11.78	+86.6	7.1
Luxembourg	129.0	+35.5	3.4	36.64	+49.3	4.1
Hungary	25.1	+41.8	3.9	10.80	+63.3	5.6
Malta	25.2	-2.8	-0.4	12.30	+3.7	0.4
Netherlands	183.6	+7.0	0.7	68.77	+23.1	2.3
Austria	67.8	+18.7	1.9	28.47	+17.2	1.7
Poland	16.2	+36.1	3.4	6.59	+41.1	3.8
Portugal	35.4	+61.6	5.4	13.15	+65.6	5.7
Romania	12.6	+6.7	0.7	5.95	+12.4	1.3
Slovenia	17.7	+12.7	1.3	7.89	+30.6	3.0
Slovakia	55.2	+38.0	3.6	13.67	+46.8	4.3
Finland	73.9	+31.0	3.0	23.69	+52.6	4.8
Sweden	113.7	+23.4	2.3	32.45	+22.7	2.2

Source: Own calculation based on the data from [5, 7, 8].

Agricultural output value per 1,000 AWU increased by 25.5% in the analyzed at the EU level from Euro 40 Million in 2011 to Euro 60 Million in 2020.

In most of the member states, it was noticed an increased efficiency of the labor force input use, except Malta where it was recorded a decline of -2.8%.

The highest increase of this indicator was noticed in: Latvia +100, Bulgaria +90.5%, Estonia +65.6%, Portugal +61.6%, Lithuania +49.75, Spain +48.7% and Hungary +41.8%.

The lowest growth rate, accounting for +0.69%, was registered in Croatia, practically meaning a stagnation at the same level with the one recorded in 2011 (Table 3).

Based on the value of agricultural output per 1,000 AWU, in 2020, the EU countries were classified in various groups as presented in Table 4.

Table 4. Classification of the EU countries in comparison with the EU average agricultural output value per 1,000 AWU in 2020, accounting for Euro 50.2 Million

Classes	**Interval Euro Million**	**Countries**
Higher than the EU average = Euro 50.2 Million		
Over 100% higher than the EU average	Over 50.2	1. Denmark 2.Netherlands 3.Belgium 4.Luxembourg 5.Germany 6.Sweden 7.France
76-99.9% higher than the EU average	87.85-100.4	None
51-75.9% higher than the EU average	75.3-87.84	None
25-50.9% higher than the EU average	62.75-75.2	1.Finland 2.Austria 3.Spain
0-24.9% higher than the EU average	50-62.74	1.Slovakia 2.Estonia 3.Ireland 4.Czechia 5.Italy
Lower than the EU average = Euro 50.2 Million		
-25.6: -0.1% lower than the EU average	50.1- 37.65	None
-50; -25.1% lower than the EU average	37.66- 24.6	1.Cyprus 2.Portugal 3.Lithuania 4.Greece 5.Malta 6.Hungary
-75; -50.1% lower than the EU average	24.5 - 12.5	1.Latvia 2.Bulgaria 3.Slovenia 4.Poland 5.Croatia 6.Romania

Source: Own conception and results.

Gross value added per 1,000 AWU increased by 27.5% in the analyzed interval at the EU level from Euro 16.33 Million per 1,000 AWU in 2011 to Euro 20.83 Million per 1,000 AWU in 2020.

The highest level in the decreasing order of the absolute value was recorded by Netherlands (68.77), Denmark 956.8), Germany (43.56), France (41.9), Belgium (41.57), Spain (37.33), Luxembourg (36.64), Sweden (32.45), Italy (29) and Austria (28.47).

The EU countries were also classified based on gross value added per 1,000 AWU registered at the EU level in 2020 which accounted for Euro 20.83 Million (Table 5).

Table 5. Classification of the EU countries in comparison with the EU average gross value added per 1,000 AWU in 2020, accounting for Euro 20.83 Million

Classes	**Interval Euro Million**	**Countries**
Higher than the EU average = Euro 20.83 Million		
Over 200% higher than the EU average	Over 62.49	1. Netherlands
175- 199.9% higher than the EU average	57.28 - 62.48	None
150 - 174.9% higher than the EU average	52.07 -59.27	1. Denmark
126 - 149.9% higher than the EU average	47.07-52.06	None
100-125.9% higher than the EU average	41.66-47.06	1.France 2.Germany
75-99.9% higher than the EU average	36.45 - 41.65	1.Luxembourg 2.Spain 3.Belgium
50-74.9% higher than the EU average	31.24 - 36.44	1.Sweden
25- 49.9% higher than the EU average	26.03-31.23	1.Austria 2.Italy
0-24.9% higher than the EU average	20.93- 26.02	1.Finland
Lower than the EU average = Euro 20.83 Million		
-25.%: -0.1% lower than the EU average	15.63 -29.82	1.Cyprus 2.Czechia 3.Ireland
-50; -25.1% lower than the EU average	10.42 - 15.62	1.Greece 2.Slovakia 3.Estonia 4.Portugal 5.Malta 6.Lithuania 7.Hungary
-75; -50.1% lower than the EU average	5.21-15.61	1.Bulgaria 2.Latvia 3.Slovenia 4.Croatia 5.Poland 6.Romania

Source: Own conception and results.

Using the Point method and giving points for each country according to its position in this classification based both on the value of the agricultural output per 1,000 AWU and also on gross value added per 1,000 AWU, it was obtained a final hierarchy where the top countries having the highest efficiency of the use of labor force input are the following ones: Denmark and Netherlands on the 1st position, Germany and Belgium on the 2nd position, France and Luxembourg on the 3rd position, Sweden on the 4th position, Spain on the 5th position, Austria and Finland on the 6th position and Italy on the 7th position.

Labour productivity in terms of Indicator A or Factor income, according to the economic accounts of agriculture, is generated by two factors: net income obtained in agriculture from goods and services and the amount of work achieved in farming activities expressed in full time labor equivalent (AWU).

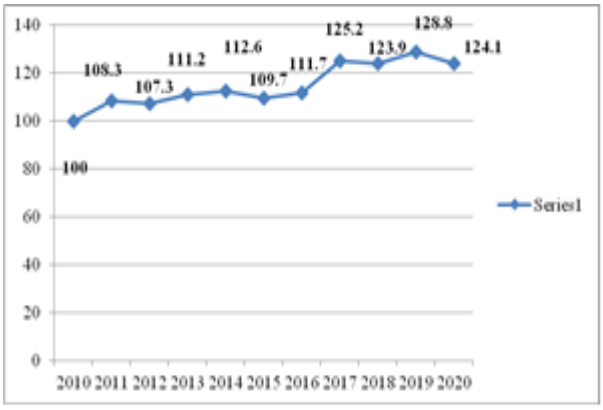

Fig. 3. Dynamics of Labor productivity in the EU agriculture in terms of Factor A in the period 2011-2020 compared to 2010= 100 (%).
Source: Own design based on the data from [6].

At the EU level, Factor A registered a general ascending trend in the period 2011-2020 compared to its level in 2010, considered term of reference (Fig. 3). Considering 2010 = 100, in Table 6, it is shown the level of Indicator A in 2020 compared to 2011 in the EU countries. From this point of view, we may notice that the counties which registered the highest Indicator A in 2020 compared to 2010, in the descending order, are: Bulgaria, Hungary, Slovakia, Lithuania, Latvia, Czechia, Croatia, Spain, Poland, Ireland, Italy and Portugal, while Belgium, Malta, Netherlands, Austria and Finland recorded lower levels than 100 (Table 6).

Table 6. Labor productivity in agricultural industry in the EU countries in terms of Factor A in 2020 and 2011 compared to 2010=100

Country	**2011**	**2020**	**Percentage change in 2020 versus 2011 (%)**
EU	**108.28**	**127.20**	**+18.92**
Belgium	89.34	84.16	-5.18
Bulgaria	115.64	246.21	+130.52
Czechia	134.84	150.26	+15.42
Denmark	112.38	106.43	-5.95
Germany	118.14	100.40	-17.74
Estonia	124.39	112.62	-11.77
Ireland	127.98	140.68	+12.7
Greece	89.07	114.38	+25.32
Spain	101.19	144.60	+43.41
France	104.58	107.12	+2.54
Croatia	95.50	150.00	+54.5
Italy	117.23	134.14	+16.91
Cyprus	74.93	126.35	+51.42
Latvia	95.82	177.98	+82.16
Lithuania	125.89	180.23	+54.34
Luxembourg	99.81	118.34	+18.53
Hungary	149.33	204.24	+54.91
Malta	87.85	83.43	-4.42
Netherlands	85.56	90.83	+5.27
Austria	114.14	99.84	-14.3
Poland	113.77	141.44	+27.67
Portugal	86.03	134.12	+48.09
Romania	129.06	120.65	-8.41
Slovenia	114.01	127.50	-13.49
Slovakia	118.63	193.49	+74.87
Finland	86.38	91.61	+5.23
Sweden	103.88	110.43	+7.55

Source: Own calculation based on the data from [6].

The classification of the countries in comparison with the EU average for Factor A, taking into consideration various intervals superior and inferior the EU mean 127.20% in 2020 is presented in Table 7. We may observe that 14 countries that is 51.85% of their total number succeeded to exceed the EU average. However, most of the member states made huge efforts to improve labor productivity. Bulgaria and Hungary are in the top position with a Factor A by 50% higher than the EU average. At the opposite corner there are Germany, Austria, Finland, Netherlands, Belgium and Malta with a Factor by 26-50% below the EU average.

Table 7. Classification of the EU countries in comparison with the EU average Factor A accounting for Euro 127.20% in 2020

Classes	Interval (%)	Countries
Factor A higher than the EU average = 127.20%		
By 50% over the EU average	Over 202.23	1. Bulgaria 2.Hungary
By 26-50% higher than the EU average	152.22- 202.22	1.Slovakia 2.Lithuania 3.Latvia
By 25% higher than the EU average	127.21-152.21	1. Czechia 2.Croatia 3.Spain 4.Poland 5.Ireland 6. Italy 7.Portugal 8.Slovenia 9.Cyprus
Factor A lower than the EU average = 127.20%		
By 25% below the EU average	102.2-127.20	1.Romania 2.Luxembourg 3.Greece 4.Estonia 5.Sweden
By 26-50% below the EU average	77.19-102.1	1.Germany 2.Austria 3.Finland 4.Netherlands 5.Belgium 6.Malta

Source: Own conception and results.

CONCLUSIONS

The EU is still a big employer in agriculture due to the specificity of the production processes in this field. However, the employment rate is declining and in 2019 it accounted for 4.37%. the member states with a higher employment rate than 8% are Poland, Romania, Italy, Spain and France.

The study analyzed the dynamics of labour productivity in the EU countries and pointed out that its level is influenced by two key factors: net value added obtained in this sector and agricultural labor input in terms of annual work unit. While net value added has a general increasing trend, labour input is declining.

In the period 2011-2020, the EU agricultural output value and gross value added have definitely increased, accounting for Euro 411.77 Billion and, respectively, Euro 176,96 Billion in 2020. About 76.15% of the EU agricultural output is given by 7 countries: France, Germany, Italy, Spain, Netherlands, Poland and Romania. Regarding GVA, the highest contribution to its level is given by: Italy, France, Spain, Germany, Poland, Netherlands, Romania and Greece, all together accounting for 82.95%.

Of course, there are still discrepancies regarding both agricultural output value and GVA from a country to another, and in consequence labour productivity has various levels.

In 2020, agricultural output value per 1,000 AWU reached Euro 60 Million and GVA Euro 20.83 Million. The average agricultural output value per 1,000 AWU at the EU level in 202O was Euro 50 Million, but only Denmark, Netherlands, Belgium, Luxembourg, Germany, Sweden, France succeeded to reach levels higher than 100% of the EU mean. At the opposite pole, there are countries like Latvia, Bulgaria, Slovenia, Poland, Croatia and Romania with an agricultural output value per 1,000 AWU representing between -50 and -75% of the EU average.

Concerning Gross value added per 1,000 AWU the EU average level accounted for Euro 20.83 Million in 2020, and only Netherlands, Denmark, France, Germany succeeded to reach a level by over 100% higher than the EU mean. The countries with the lowest GVA in agriculture per 1,000 AWU were Bulgaria, Latvia, Slovenia, Croatia, Poland and Romania (till -75% of the EU mean).

Labour productivity in terms of Indicator A or Factor income accounted for 124% of the level 100% in 2010. In 2020, the highest level of Indicator A was recorded by Bulgaria and Hungary,

which succeeded to reach a level by 50% higher than the EU average 124%. Germany, Austria, Finland, Netherlands, Belgium are a group which recorded a level by 25-50% lower than the EU mean.

In conclusion, the efforts for increasing agricultural production value and GVA per 1,000 AWU made by the EU member states have led to various results in term of efficiency of the use of labour force, and for the moment we could not affirm that there is a convergence regarding this aspect.

How to increase the efficiency of labor force input in the EU agriculture?

Looking at the determinants of labor productivity, we may consider that they could offer the right answers to this question as follows:

(a) To increase agricultural output performance, meaning to pay attention to grow its volume, to improve its structure, product and service quality and also to take into consideration price level;

- To raise agricultural production output value requires either a higher input of goods and services, that is intermediate consumption or lower inputs, and the strategies adopted to be suitable to each member state depending on the structure of agriculture by sectors.

- Also, the improvement of product and service quality has to be an important objective resulting in a higher output value is the quality is higher and closely linked to a better price;

- To improve the structure of agricultural output means to balance the ratio between vegetal , animal and service sectors, the changes being justified by market requirements, production input and output, price/quality ratio.

(b) To optimize intermediate consumption regarding the main inputs; seeds, planting materials, fertilizers, pesticides, insecticides, soil improvers, fuels, animal feedstuffs, medicines, veterinary services and the cost of these inputs must be the solution to the game between the purchasing volume, structure and price.

(c) The solutions are subject of decision making which belongs to each member state depending on the local situation in vegetal, animal and service sectors, but having in mind the general directions established by CAP for ensuring the sustainable agriculture development in the EU.

In this respect, a special attention has to be paid to pesticides which have to be used according to the EU regulations regarding the reduction of risks.

Fertilizers are still needed, but their use, especially regarding Nitrogen and Phosphorus as active substance, have to be scientifically justified for avoiding the excessive utilization which could increase soil and water pollution and diminish biodiversity and also the deficit.

(d) The reduction of labor force input in agriculture depends on the potential available working population as age, education level and also on the technical endowment and technologies applied and farm structure in terms of size and profile. In this respect, rural population aging and migration could be favorable factors, but it is needed to continue to offer incentives to create the new generation of young farmers with high knowledge and skills able to develop a successful entrepreneurship.

(e) More than this, the increase of labor productivity has to keep pace with the need of adaptation to the challenges imposed by climate change. New technological solutions and new areas of favorability suitable to various crops have to be found in order to diminish the negative effects of the extreme climate phenomena.

(f)Not to forget that since May 2020, the EU adopted a new Farm to Fork strategy as

mentioned by the European Green Deal, which aims to transform this part of the world in a " healthy and environmentally friendly food system by 2050". This means a high agricultural performance based on land use diversity, soil water and air protection, biodiversity conservation and landscape preservation.

An efficient labor force use in agriculture means high qualified, conscious, responsible, workable and devoted labor input.

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