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TRENDS IN AGRICULTURAL LABOUR PRODUCTIVITY IN THE EU

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Abstract. Labour productivity represents production efficiency and is the key factor in income and consequently the standard of living. Incomes are lower in rural areas than in urban areas in any country. Labour productivity in the agricultural industry varies significantly, i.e. tenfold, across EU Member States, with the lowest labour productivity being reported mostly in East European Member States, which makes it necessary to achieve higher productivity in these Member States. The present research aims to examine trends in agricultural labour productivity in EU Member States. The research found that the fastest increase in agricultural labour productivity occurred in East European Member States, while a mixed situation was observed in West European Member States, i.e. in some Member States the productivity increased at a lower rate or even decreased. An analysis of correlation between agricultural labour productivity and the number and average size of agricultural holdings revealed that the situation was mixed across the Member States, with some of them showing a positive trend, whereas some had a negative trend. The Member States with the lowest agricultural labour productivity need to foster increases in it through encouraging their farmers to own/manage larger areas and take advantage of economies of scale.

Key words: agriculture, labour productivity, EU Member States.

JEL code: Q1

Introduction

Disparities in the standard of living (incomes) between countries, as well as between urban and rural areas vary, sometimes very significantly. One of the factors is disparities in labour productivity, especially this refers to those between countries. Low labour productivity in East European Member States is a problem both for rural areas and the entire national economy, mostly the tradable sector or the business economy. Solving a problem such as low incomes in rural areas particularly in East European Member States requires increasing labour productivity in agriculture and other primary industries. Accordingly, it is important to examine trends in agricultural labour productivity in each EU Member State, focusing particularly on East European Member States.

Disparities in agricultural labour productivity between EU Member States have been a research focus for a number of researchers. For example, A. Pawlewicz and K. Pawlewicz (2018) have found that the countries that joined the EU in 2004 and 2007 differed considerably from the EU-15 Member States in land, labour and capital productivity. L. Wicki (2012) has established that in the period 1998-2011, the Member States with lower initial labour efficiency showed a higher average growth rate but absolute growths were lower there. No convergence has been found with respect to labour efficiency in agriculture and the division into two groups (old and new Member States) has persisted. The most important factors limiting the occurrence of convergence were connected with farm structure and the number of agricultural workers. C. Forgacs (2020) has found that land and labour productivity depended on farm specialization.

The present research employed Eurostat data on agriculture and aims to examine trends in agricultural labour productivity in EU Member States. To achieve the aim, the following specific research tasks were set: 1) to examine disparities in agricultural labour productivity and long-term changes therein in EU Member States; 2) to identify correlations between agricultural labour productivity and the number and average size of agricultural holdings.

The research employed statistical analysis and correlation analysis to identify the strength of correlation between the mentioned variables based on Eurostat data.

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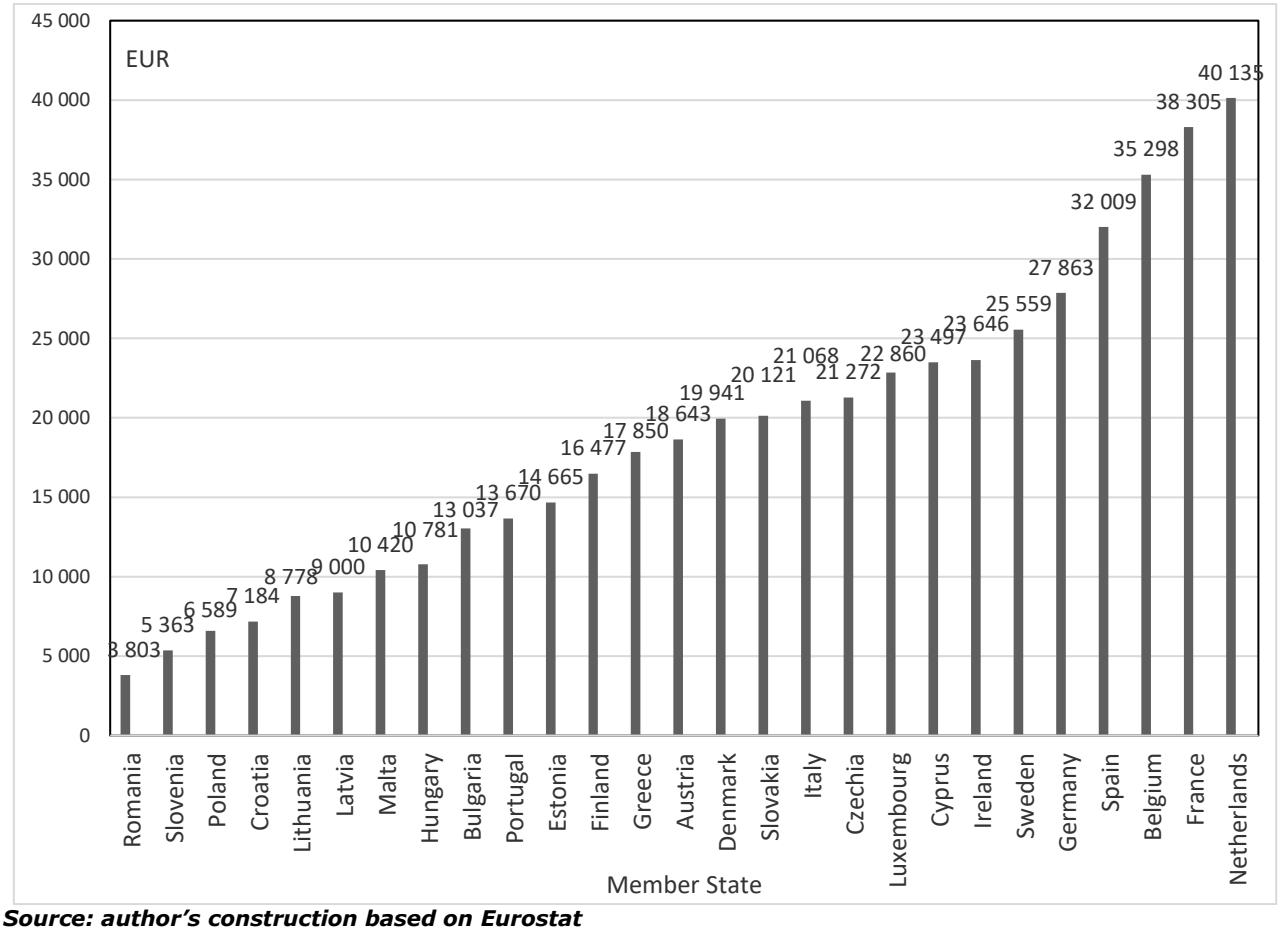
Research results and discussion

Because of the specifics of agriculture, labour productivity in the agricultural industry is measured as factor income expressed per full-time labour equivalent (annual work unit – AWU). It is a measure of the net value added by the equivalent of each full-time worker in the agricultural industry, measured in real terms (adjusted for inflation) (Eurostat). Agricultural labour productivity is affected by a number of factors, e.g. the size of farms. J. Golebiewski (2013) has found that a higher increase in labour productivity was observed among the large agricultural production enterprises, which have attained the level comparable with the highly developed EU Member States or even the USA. The larger the farm in size is, the higher labour productivity the farm can achieve. For this reason, an increase in average farm size is definitely a positive trend, which decreases the number of farms in a country. A. Kijek et al. (2020) have found that convergence processes took place in the groups of countries with low and medium levels of labour productivity. In the club of countries where labour productivity was high, opposite processes (i.e. divergence) were observed. A. Nipers et al. (2018) have projected a significant increase in labour productivity in various agricultural industries in Latvia in the period up to 2030 and also beyond.

1. Disparities in agricultural labour productivity across the EU Member States

In 2021, as shown in Figure 1, the lowest agricultural labour productivity was reported in Romania at approximately 4000 EUR/employee, whereas the highest figure was in the Netherlands with more than 40000 EUR/employee, i.e. the disparity was tenfold, which was abnormally wide, requiring making labour productivity-focused agricultural policies in the Member States with low agricultural labour productivity.



Source: author's construction based on Eurostat

Fig. 1. **Agricultural labour productivity in EU Member States in 2021**

Agricultural labour productivity was low in almost all East European Member States, with the exception of Czechia and Slovakia, as well as in Malta and Portugal. The relatively high productivity in Czechia and Slovakia and the relatively low productivity in Malta and Portugal could be explained if analysing the average size of holdings in the EU Member States (see below). Next, the research analyses change in agricultural labour productivity in the Member States in a 20-year period.

Table 1

Agricultural labour productivity and changes therein in EU Member States in 2001-2021

Member State/Year	2001	2005	2010	2015	2020	2021	2021/ 2001, %
Belgium	32 403	30 034	40 938	37 808	39 283	35 298	8.9
Bulgaria	3 777	3 209	3 956	6 172	9 810	13 037	245.2
Czechia	7 857	10 462	12 962	17 885	21 187	21 272	170.7
Denmark	42 480	33 664	39 554	27 496	31 641	19 941	-53.1
Germany	22 733	20 002	28 819	23 815	29 415	27 863	22.6
Estonia	4 574	8 289	12 366	12 415	14 663	14 665	220.6
Ireland	18 147	19 451	13 925	16 667	20 311	23 646	30.3
Greece	15 983	13 387	16 263	15 677	18 813	17 850	11.7
Spain	27 918	25 015	24 314	30 450	34 063	32 009	14.7
France	26 355	24 266	30 490	32 673	32 928	38 305	45.3
Croatia*	n.d.	4 189	5 056	5 345	7 278	7 184	71.5
Italy	20 955	18 069	15 647	20 681	21 438	21 068	0.5
Cyprus	14 575	13 962	16 124	16 391	23 346	23 497	61.2
Latvia	1 755	3 168	4 536	5 927	8 884	9 000	412.8
Lithuania	2 027	3 576	4 501	6 092	8 546	8 778	333.1
Luxembourg	31 166	28 619	19 727	19 170	22 555	22 860	-26.7
Hungary	3 502	4 383	5 239	7 959	10 119	10 781	207.9
Malta	17 799	16 884	15 745	14 746	11 043	10 420	-41.5
Netherlands	45 833	40 298	46 339	47 102	41 214	40 135	-12.4
Austria	17 670	17 096	19 383	16 337	18 446	18 643	5.5
Poland	2 020	2 842	4 289	4 801	6 896	6 589	226.2
Portugal	8 706	8 262	8 669	10 088	12 308	13 670	57.0
Romania	3 001	2 637	3 206	3 726	4 124	3 803	26.7
Slovenia	2 894	4 788	5 131	5 854	6 663	5 363	85.3
Slovakia	5 208	5 551	9 352	13 360	19 371	20 121	286.3
Finland	21 077	21 337	26 399	17 930	21 269	16 477	-21.8
Sweden	17 964	19 825	24 332	26 069	24 968	25 559	42.3

** - for Croatia, the period of analysis is 2005-2021 due to data unavailability*

Source: author's calculations based on Eurostat

In the period 2001-2021 in most of the East European Member States, agricultural labour productivity tended to steadily increase, which could be explained by the low initial level of agricultural labour productivity in these Member States; their accession to the EU fostered increases in it. In contrast, the situation was diverse in West European Member States. In Finland, for example, the highest agricultural

labour productivity was achieved in 2012, which was volatile and tended to slightly decrease in the next years.

In the period of analysis, the lowest productivity was reported in Latvia (less than 2 thou. EUR/employee in 2001, yet the country succeeded in increasing it significantly over this period (second highest increase in relative terms). The relatively highest increase was achieved by Bulgaria (245%) in this period. In 2001 compared with Latvia, a little higher productivity was reported in Lithuania and Poland (slightly more than 2 thou. EUR/employee), and both countries also succeeded in significantly increasing it by 333% and 226%, respectively. Among East European Member States, the relatively lowest increase was observed in Romania at 27% (in absolute terms, the country had the lowest productivity in the EU in 2021), and several West European Member States had a higher rate of increase in productivity: Cyprus (61%), Portugal (57%), France (45%), Sweden (42%) and Ireland (30%). In the 20-year period, however, the following Member States – all of them represented Western Europe – had a decrease in productivity: Denmark (-53%), Luxembourg (-27%), Malta (-42%), the Netherlands (-12%) and Finland (-22%). The figures for Denmark and Finland were significantly higher for 2020 than for 2021; in other Member States, the situation was diverse in 2021 compared with 2020 – some of them reported also a decrease, whereas some Member States reported an increase, which was presumably determined by some country-specific factors, as price changes in the single EU market are similar and so are other factors.

2. Correlation between agricultural labour productivity and selected variables

The research calculated coefficients of correlation between agricultural labour productivity and two variables: number and average size of holdings. Both variables are interdependent because, for example, a decrease in one variable leads to an opposite change in the other, as utilised agricultural areas do not tend to change significantly. Eurostat provides data on the number of holdings only for the years 2005, 2007, 2010 and 2013; therefore, the research selected data on agricultural labour productivity for the same years. It needs to be noted that a negative correlation coefficient indicates a positive trend in the agricultural industry, i.e. an increase in efficiency, as labour productivity increases owing to decreases in the number of holdings. As shown in Table 2, a strong negative correlation was found for almost all East European Member States, except for Croatia and Slovenia. The strongest negative correlation (positive trend) was found for Bulgaria, Hungary, Slovakia, Poland and all the Baltic States. As regards West European Member States, a positive correlation was identified for Luxembourg, Malta and Austria (insignificant), whereas a very strong negative correlation was found for Denmark, Italy, Germany and the Netherlands that could be considered to be leaders in this respect among the West European Member States. Overall, the positive trend prevailed in the EU – the number of holdings tended to decrease, thereby increasing agricultural labour productivity and consequently incomes in rural areas.

Table 2

Correlation between agricultural labour productivity and the number of holdings (thou.) in EU Member States

Member State/Year	2005	2007	2010	2013	2005	2007	2010	2013	Cor. coef.
	agricultural labour productivity				number of holdings				
Belgium	30 034	40 125	40 938	36 236	51.54	48.01	42.85	37.76	-0.43
Bulgaria	3 209	3 120	3 956	6 377	534.61	493.13	370.49	254.41	-0.94
Czechia	10 462	12 404	12 962	17 509	42.25	39.40	22.86	26.25	-0.67
Denmark	33 664	38 289	39 554	42 198	51.68	44.62	41.36	38.28	-1.00
Germany	20 002	26 366	28 819	35 400	389.88	370.48	299.13	285.03	-0.90
Estonia	8 289	11 273	12 366	16 391	27.75	23.34	19.61	19.19	-0.89
Ireland	19 451	17 721	13 925	16 603	132.67	128.24	139.89	139.60	-0.70
Greece	13 387	13 750	16 263	13 707	833.59	860.15	723.06	709.50	-0.53
Spain	25 015	26 867	24 314	27 446	1 079.42	1 043.91	989.80	965.00	-0.29
France	24 266	30 321	30 490	27 302	567.14	527.35	516.10	472.21	-0.39
Croatia*	4 189	5 037	5 056	4 573	n.d.	181.25	233.28	157.44	0.76
Italy	18 069	17 055	15 647	23 318	1 728.53	1 679.44	1 620.88	1 010.33	-0.91
Cyprus	13 962	12 644	16 124	18 317	45.17	40.12	38.86	35.38	-0.73
Latvia	3 168	4 274	4 536	4 705	128.67	107.75	83.39	81.80	-0.95
Lithuania	3 576	4 760	4 501	6 231	252.95	230.27	199.91	171.80	-0.89
Luxembourg	28 619	33 193	19 727	17 932	2.45	2.30	2.20	2.08	0.76
Hungary	4 383	5 018	5 239	7 943	714.79	626.32	576.81	491.33	-0.91
Malta	16 884	16 269	15 745	12 631	11.07	11.02	12.53	9.36	0.71
Netherlands	40 298	47 385	46 339	48 030	81.83	76.74	72.32	67.48	-0.82
Austria	17 096	21 512	19 383	18 424	170.64	165.42	150.17	140.43	0.03
Poland	2 842	3 817	4 289	5 754	2 476.47	2 390.96	1 506.62	1 429.01	-0.85
Portugal	8 262	7 847	8 669	9 184	323.92	275.08	305.27	264.42	-0.28
Romania	2 637	1 985	3 206	3 641	4 256.15	3 931.35	3 859.04	3 629.66	-0.60
Slovenia	4 788	5 191	5 131	4 675	77.17	75.34	74.65	72.38	0.26
Slovakia	5 551	7 156	9 352	12 182	68.49	68.99	24.46	23.57	-0.89
Finland	21 337	24 283	26 399	22 758	70.62	68.23	63.87	54.40	-0.10
Sweden	19 825	27 320	24 332	22 506	75.81	72.61	71.09	67.15	-0.22

** - for Croatia, data for the year 2005 are unavailable*

Source: author's calculations based on Eurostat

Next, the research calculated the average size of holdings for each Member State based on data presented in Table 2 (number of holdings). As shown in Table 3, the average sizes of holdings were very diverse across the EU, ranging from 1.2 ha in Malta to 133 ha in Czechia. Abnormally small average sizes were also in Cyprus (3.1 ha), Romania (3.6 ha), Slovenia (6.7 ha) and Greece (6.8 ha). Nevertheless, Greece, Malta and Cyprus, located in the Mediterranean region, had relatively high agricultural labour productivity, whereas two East European Member States – Romania and Slovenia – had approximately threefold lower productivity. This allows us to conclude that Mediterranean farming gives a possibility to reap two harvests a year and enables small farms to achieve high labour productivity. Certainly, other factors such as agricultural cooperation and specific crops also contribute to it.

Even though a few Member States had a small average size of holdings and, at the same time, achieved relatively high agricultural labour productivity, normally a large size of holdings is a way to achieve high agricultural labour productivity and contribute to higher incomes in rural areas. Table 3 also presents calculations of correlation between agricultural labour productivity (based on data presented in Table 2) and the average size of holdings. The calculation results revealed that the coefficients of correlation were both positive (positive trend) and negative (negative trend), as an increase in the average size of holdings should lead to an increase in agricultural labour productivity. A negative correlation was identified for Ireland, Croatia, Cyprus, Luxembourg, Malta and Slovenia. Agricultural labour productivity in Ireland, Cyprus and Luxembourg was relatively high and steady over the 20-year period (Table 1), and only Malta performed poorer in recent years. For this reason, one can conclude that a negative correlation identified for the four mentioned Member States do not indicate a pronounced negative situation in farming. As regards Croatia, the situation was different, as agricultural labour productivity in the country in the years of analysis did not tend to increase, yet the average size of holdings increased twofold, which was a positive trend. In the period 2015-2021, however, agricultural labour productivity increased in Croatia, which definitely was also a positive trend. This allows us to conclude that the negative trend identified for Croatia in the period 2007-2013 changed to positive in the later period.

Table 3

Utilised agricultural areas and correlation between agricultural labour productivity and the average size of holdings in EU Member States

Member State/Year	2005	2007	2010	2013	2013/ 2007, %	2005	2007	2010	2013	Cor. coef.
	utilised agricultural area					average size of holdings				
Belgium	1385.6	1374.4	1358.0	1307.9	-5.6	26.9	28.6	31.7	34.6	0.4
Bulgaria	2729.4	3050.7	4475.5	4650.9	70.4	5.1	6.2	12.1	18.3	1.0
Czechia	3557.8	3518.1	3483.5	3491.5	-1.9	84.2	89.3	152.4	133.0	0.6
Denmark	2707.7	2662.6	2646.9	2619.3	-3.3	52.4	59.7	64.0	68.4	1.0
Germany	17035.2	16931.9	16704.0	16699.6	-2.0	43.7	45.7	55.8	58.6	0.9
Estonia	828.9	906.8	940.9	957.5	15.5	29.9	38.9	48.0	49.9	0.9
Ireland	4219.4	4139.2	4991.4	4959.5	17.5	31.8	32.3	35.7	35.5	-0.9
Greece	3983.8	4076.2	5177.5	4856.8	21.9	4.8	4.7	7.2	6.8	0.7
Spain	24855.1	24892.5	23752.7	23300.2	-6.3	23.0	23.8	24.0	24.1	0.4
France	27590.9	27476.9	27837.3	27739.4	0.5	48.6	52.1	53.9	58.7	0.3
Croatia*	n.d.	978.7	1316.0	1571.2	60.5	-	5.4	5.6	10.0	-1.0
Italy	12707.9	12744.2	12856.1	12098.9	-4.8	7.4	7.6	7.9	12.0	0.9
Cyprus	151.5	146.0	118.4	109.3	-27.8	3.4	3.6	3.0	3.1	-0.9
Latvia	1701.7	1773.8	1796.3	1877.7	10.3	13.2	16.5	21.5	23.0	0.9
Lithuania	2792.0	2649.0	2742.6	2861.3	2.5	11.0	11.5	13.7	16.7	0.9
Luxembourg	129.1	130.9	131.1	131.0	1.5	52.7	56.9	59.6	63.0	-0.8
Hungary	4266.6	4228.6	4686.3	4656.5	9.1	6.0	6.8	8.1	9.5	0.9
Malta	10.3	10.3	11.5	10.9	6.1	0.9	0.9	0.9	1.2	-1.0
Netherlands	1958.1	1914.3	1872.4	1847.6	-5.6	23.9	24.9	25.9	27.4	0.8
Austria	3266.2	3189.1	2878.2	2726.9	-16.5	19.1	19.3	19.2	19.4	0.2
Poland	14754.9	15477.2	14447.3	14409.9	-2.3	6.0	6.5	9.6	10.1	0.9
Portugal	3679.6	3472.9	3668.2	3641.6	-1.0	11.4	12.6	12.0	13.8	0.6
Romania	13906.7	13753.1	13306.1	13055.9	-6.1	3.3	3.5	3.4	3.6	0.4
Slovenia	485.4	488.8	482.7	485.8	0.1	6.3	6.5	6.5	6.7	-0.3
Slovakia	1879.5	1936.6	1895.5	1901.6	1.2	27.4	28.1	77.5	80.7	0.9
Finland	2263.6	2292.3	2291.0	2282.4	0.8	32.1	33.6	35.9	42.0	0.1
Sweden	3192.5	3118.0	3066.3	3035.9	-4.9	42.1	42.9	43.1	45.2	0.1

** - for Croatia, data for the year 2005 are unavailable*

Source: author's calculations based on Eurostat

The research found that overall in the EU, a positive trend prevailed in the average sizes of holdings that tended to increase, utilised agricultural areas were steady in most of the Member States with some exceptions. In the period presented in Table 3, a significant decrease was reported in Cyprus, yet in the later period the decrease changed to an increase. Only Austria has significantly decreased its utilised agricultural area.

Conclusions, proposals, recommendations

1) The disparity in agricultural labour productivity was tenfold between EU Member States, in the range of approximately 4-40 thou. EUR/AWU, i.e. abnormally wide, with the lowest productivity being

reported in EastvEuropean MemberVStates, which needs to be reduced through making labour productivity-focused agricultural policies in most of the East European Member States.

2) In the period 2002-2021 in most of the East European Member States, agricultural labour productivity tended to steadily increase, which was a positive trend.

3) Agricultural labour productivity in Czechia and Slovakia was relatively high, the highest among East European Member States, which was due to the largest average sizes of holdings among all the EU Member States, 133 ha and 81 ha, respectively.

4) In the Member States of the Mediterranean region – Greece, Malta and Cyprus – the average farm size was very small, although agricultural labour productivity was relatively high, which was determined by a possibility to have two harvests a year owing to the favourable Mediterranean climate and specific crops.

5) An analysis of correlation between agricultural labour productivity and the number and average size of agricultural holdings revealed that the situation was mixed across the Member States, with most of them showing a positive trend, whereas some had a negative trend (Malta, Luxembourg), which determines the need to implement a specific agricultural policy.

6) The Member States with the lowest agricultural labour productivity need to foster increases in it through introducing support measures aimed at encouraging their farmers to own/manage larger areas, thereby taking advantage of economies of scale.

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