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Output value and productivity of agricultural industry in Central-East Europe

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Abstract: The study analyses the correlations among different economies of selected EU-12 member states based on comparison of agricultural economics variances, namely the output value of the agricultural industry, productivity of input, agricultural gross value added, subsidies on production, agricultural labour input and agricultural income per annual working unit in the period of 2010–2016, based on the Special Program for Social Sciences, as statistical methods. The EU-12 achieved a higher increase in productivity of input, output value of agricultural industry, agricultural gross valued added, as well as agricultural income per agricultural annual working unit compared to the average results of EU-28 for 2010–2016. The output value of agricultural industry and agricultural gross value added per intermediate consumption decreased by 1.35% and by 3.3%, but the factor income – net value added at factor cost – per annual working unit increased by 21%, because of the subsidies on production increased by 3.4% for 2010–2016. In EU-28, the factor income per annual working unit increased, but most of this income was for developing agricultural production technology.

Keywords: annual working unit; gross value added; intermediate consumption; labour input; subsidies

The study analyses the correlations among the different economies of the selected EU-12 member states based on comparison of agricultural economics variances, namely the output value of the agricultural industry (*OutputValue*1), agricultural gross value added (*GValAdded*2), subsidies on production (*SubsidProd*3), agricultural labour input (*AgrLabinput*4) and agricultural income per annual working unit (*AgrincAWU*5) in the period of 2010–2016. The study emphasizes the share of the selected EU-12 member states in the EU-28 in field of the above mentioned agricultural production, gross value added, subsidies and agricultural incomes. The selected EU-12 member states analysed in the research are Bulgaria, Czech Republic, Hungary, Latvia, Lithuania, Slovakia, Cyprus, Estonia, Poland, Croatia, Romania and Slovenia in Central-East Europe. The general comparison among the selected EU-12 member states was done to describe their differences and similarities in the agricultural sector and their productivity of input and income possibilities of annual working unit, as agricultural labour input for the agricultural production. The main aim for the Hungarian agricultural producers was to increase their capital accumulation to implement improvement of production technology in order to be competitive on the world and domestic markets (Szabó and Zsarnóczai 2004).

The agricultural research concerning the agricultural issues of EU-12 member states is important, because these states realised a considerable development process in the agricultural production and income conditions in this economic sector compared to all EU-28 for period of 2010–2016 (Kopsidis 2014). The development of agriculture is emphasized by the main strategic aims to ensure more favourable productivity of agricultural industry based on the calculation with intermediate consumption (input) and agricultural income per annual working unit (AWU) concerning the output value of agricultural industry, gross value added (GVA), and factor income (net value added at factor price) and the importance of subsidies (Nowak and Kaminska 2016).

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The object of the research is important, because the agriculture ensures food-supply, possible whole food self-sufficiency and less dependence on the world economy. Also the importance of agriculture is to ensure: (i) more jobs and increase employment; (ii) enough income possibilities by developing productivity with technological development and increasing effect of labour input; (iii) increased standard of life for farmers and their families; (iv) diversification of agricultural production and different activities of farm; (v) welfare for the employees in agricultural sector in order that the rural population not to migrate from their original places.

The world economic crisis of 2008 strengthened the decline of output value, while the little increase of productivity occurred only in several countries of EU-11. The market conditions were less favourable for the agricultural producers, therefore this pressed down the production and output level. Relatively favourable mechanization in EU-11 could not result in increasing growth of output, and also the mechanization could not be so efficient. Moreover, the input price increase was higher than the price level of output, which led to less favourable income positions of agricultural producers (Tables 1–2) (Eurostat 2018a).

As to the gross value added (GVA) in EU-11, it decreased by 8.7% more than the output value for the period of 2005–2010, which resulted from the unfavourable productivity of input. In EU-27, the decrease of productivity of input and GVA was not so different, mostly the results were close to each other.

Some experts also strengthened a higher increase of EU-11 than EU-27: "The only bright spot has been TFP (Total Factor Productivity) growth in the new member states (EU-11), which averaged around 1.6% growth per annum over the 2002 to 2011 period. However, these countries account for a relatively minor share of total agricultural output in the EU, so TFP growth in the EU-27 over the past decade was a disappointing 0.6% per annum" (Matthews 2014). Haniotis (2013) declared that in EU-11 the TFP increased by about 1.7%, in EU-27 this was 0.6% and also the labour productivity (AWU) was 4% in EU-11 and 1.7% in EU-27 for 2000–2011.

In EU-28 the productivity of input decreased by 1.35% for 2010–2015, while the output value of agricultural industry increased by 8.6 for the same period. Yet, in EU-12 the productivity of input increased mostly same, by 1.01% and the output increased by 11.7% for the same time. Czech Republic, Hungary, Slovakia and Bulgaria achieved considerable productivity results at the

Table 1. Changes of productivity of input, agricultural gross value added between 2005–2010 and subsidies on production in 2016

Member States	Productivity of input 2016 (%, 2010 = 100)	Agricultural gross value added			Subsidies on production	
		2010 (%, 2005 = 100)	2016 (million EUR)	% (2010 = 100)	2016 (million EUR)	% (2010 = 100)
EU-28	**1.35**	**–0.8**	**165 654**	**6.5**	**52 628**	**3.4**
Bulgaria	16.00	–15.0	1 777	31.0	615	32.3
Czech Republic	12.00	–23.0	1 588	64.6	1 135	6.9
Estonia	–9.00	–1.3	151	–36.0	167	1.2
Croatia	–5.70	–	958	–30.0	382	749.0
Cyprus	–2.70	–6.5	305	–3.2	58	45.0
Latvia	0.30	–9.0	333	41.1	289	16.0
Lithuania	5.40	11.8	998	53.3	170	–14.6
Hungary	15.70	–26.5	3 450	74.2	1 334	3.6
Poland	–5.50	14.7	8 588	4.3	3 729	22.3
Romania	–1.30	0.4	6 541	–0.8	2 828	47.9
Slovenia	4.20	–6.3	474	17.3	253	4.5
Slovakia	9.50	–34.4	626	73.4	488	12.7
EU-12*	1.01	–8.7	25 789	13.6	11 448	25.1
EU-12 of EU-28 (%)	–	–	**15.6**	–	**21.7**	–

*EU-12, in 2010–2016; Productivity of input – output value of agricultural industry per intermediate consumption (input); in 2016, 2010 = 100%, in 2005–2010, EU-11; Agricultural gross value added, 2005 = 100

Source: Eurostat (2018a): Economic Accounts for Agriculture (EAA) – dataset aact_eaa01

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Table 2. Output value of agricultural industry in selected EU-12, 2010–2016

Member States	Change 2005–2010 (%, 2005 = 100, EU-27)	2016 (million EUR)	Change 2010–2016 (%, 2010 = 100, EU-28)	Share in output value of agricultural industry in 2016 (%, EU-28)
EU-28 (2005–2010, EU-27)	**0.8**	**405 008**	**8.6**	**100.0**
Bulgaria	–3.0	4 004	4.8	1.0
Czech Republic	–0.4	4 918	21.2	1.2
Estonia	7.4	750	–14.0	0.2
Croatia	–	2 184	–25.0	0.5
Cyprus	–27.0	686	0.1	0.2
Latvia	5.5	1 316	40.0	0.3
Lithuania	5.9	2 835	38.8	0.7
Hungary	–14.0	8 309	35.2	2.1
Poland	8.2	22 411	13.5	5.5
Romania	0.9	15 444	0.9	3.8
Slovenia	–6.0	1 211	9.7	0.3
Slovakia	–17.0	2 391	26.7	0.8
EU-12 (2005–2010, EU-11)	**–3.6**	**66 459**	**11.7**	**16.6**
EU-12 of EU-28 (%)	–	**16.6**	–	–

Source: Eurostat (2018a): Economic Accounts for Agriculture (EAA) – dataset aact_eaa01

same time, which was accompanied with 13.6% growth rate in GVA, i.e. two times more than growth of EU-28 (Tables 1–2) (EC 2016; Eurostat 2018a).

MATERIAL AND METHODS

The study analyses the correlations based on the SPSS statistical analysis program (Special Program for Social Sciences) among agricultural economic variances, namely the output value of the agricultural industry (*OutputValue*1), agricultural gross value added (*GValAdded*2), subsidies on production (*SubsidProd*3), agricultural labour input (*AgrLabinput*4) and agricultural income per annual working unit (*AgrincAWU*5) in EU-12 member states in the period from 2010 to 2016 (statistical analysis program can be seen in detail in Sajtos and Mitev 2006) (Figures 1–2) (Eurostat 2018b). Based on the SPSS statistical methods the analysis focuses on correlations and significance among economic variances, which compare and classify the EU-12 member states by efficiency of production, productivity of input and income conditions per intermediate consumption – input – and annual working unit, as a farmer with full time. The statistical analyses follow the factor analyses, regression and the dendrogram (Reiff et al. 2018).

The Economic Accounts for Agriculture (EAA) from the Eurostat provide more actual data in order to achieve these economic analyses (Eurostat 2018a,b,c,d,e). The study focuses on the main statistical components of agricultural industry in EU-12 in 2010–2016. Moreover, the study focuses on the agricultural labour input and agricultural income per annual working unit (AWU) relevant to the efficiency of labour force, as AWU. The statistical method also analyses the output value of agricultural industry and agricultural gross value added per agricultural AWU according to the efficiency of AWU in EU-12 between 2010 and 2016. It is important that the output value of agricultural industry, agricultural gross value added and factor income can be calculated per intermediate consumption (input) for productivity of input in EU-28 member states.

RESULTS AND DISCUSSION

In this study, the research focuses on correlations among agricultural economic variances based on the SPSS statistical analysing system; strong correlations occur between *OutputValue*1 and *GValAdded*2 (by 0.875), and also between *OutputValue*1 and *AgrincAWU*5 (by 0.550). This means that if the *OutputValue*1 variance increases, also the *GValAdded*2 and *AgrincAWU*5 increases in case of EU-12 for the period of 2010–2016. Yet, there is a contradiction correlation between *OutputValue*1 and *SubsidProd*3, which means that when *OutputValue*1 increases the *SubsidProd*3 de-

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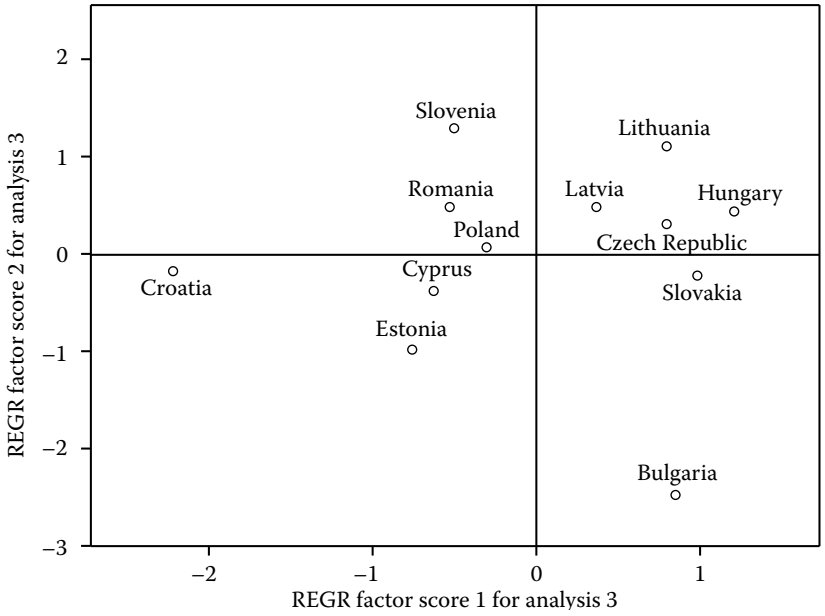

Figure 1. Factor analyses for Component-1 and Component-2

at the principle line "X" Component-1: *OutputValue*1, *GValAdded*2, (minus) *SubsidProd*3, *AgrIncAWU*5; at the principle line "Y" Component-2: *AgrLabInput*4

Source: based on the Eurostat (2018b) calculated in % originally in million EUR

creases. These processes can be followed by correlation matrix of the Table 3 (Eurostat 2018b). The *OutputValue*1 increased in EU-12 by 11.7%, therefore the *GValAdded*2 also increased (by 13.6%), subsidies averagely increased by 25.1%, but without Croatia this is only 16.16%. Generally, when gross value added increased in each country of EU-12, the subsidies on production decreased, for example in Czech Republic, Latvia, Lithuania, Hungary, Slovenia and Slovakia. When gross value added decreased, the subsidies on production increased, for example in Estonia, Croatia, Cyprus, Poland and Romania (Tables 1–2) (Eurostat 2018a).

When the *OutputValue*1 increased in EU-28 by 8.6%, the *GValAdded*2 also increased (by 6.5%), but subsidies increased less (by 3.4%) than the other two variances mentioned before. In EU-12 the *OutputValue*1 increased by 11.7% more than in case of the EU-28 and *GValAdded*2 increased by mostly 13.6% more than that of EU-28 two times more. The *SubsidProd*3 increased by 25.1%, mostly by 7.5 times more than subsidies provided for EU-28, but the reason was that Croatia, Romania, Cyprus and Bulgaria obtained considerable subsidies from common agricultural budget, because their *GValAdded*2 was at a very low level. It decreased by 30% in Croatia, 0.8% in Roma-

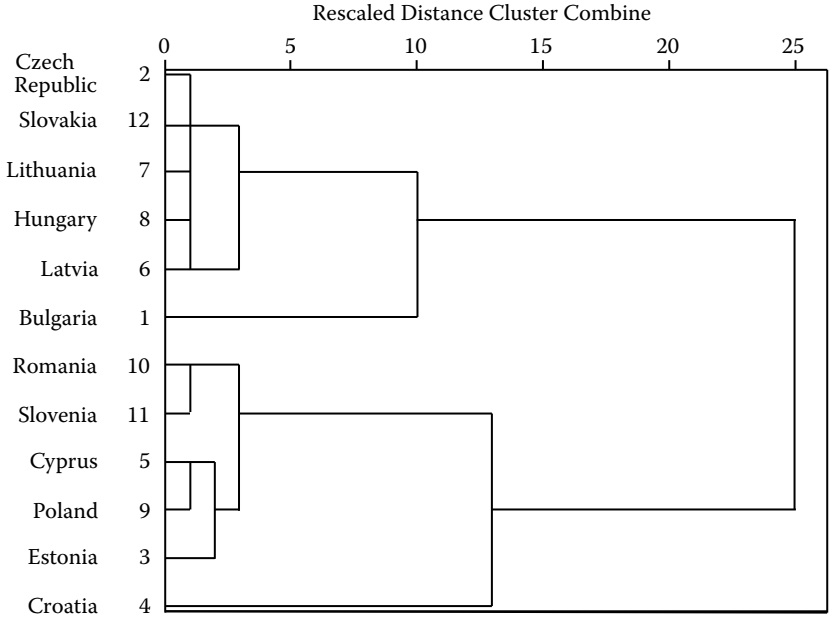

Figure 2. Dendrogram using Ward Linkage for EU-12 member states

group-1 – Bulgaria; group-2 – Czech Republic, Hungary, Latvia, Lithuania, Slovakia; group-3 – Cyprus, Estonia, Poland; group-4 – Croatia; group-5 – Romania, Slovenia

Source: based on the Eurostat (2018b) calculated in % originally in million EUR

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Table 3. Correlation matrix (%)

		*OutputValue*1	*GValAdded*2	*SubsidProd*3	*AgrLabInput*4	*AgrIncAWU*5
Correlation	*OutputValue*1	1.000	**0.875**	**–0.605**	0.426	**0.550**
	*GValAdded*2	0.875	1.000	**–0.474**	0.308	**0.764**
	*SubsidProd*3	–0.605	–0.474	1.000	–0.130	**–0.469**
	*AgrLabInput*4	0.426	0.308	–0.130	1.000	–0.116
	*AgrIncAWU*5	0.550	0.764	–0.469	–0.116	1.000
Significance (1-tailed)	*OutputValue*1	–	0.000	0.019	0.084	0.032
	*GValAdded*2	0.000	–	0.060	0.165	0.002
	*SubsidProd*3	0.019	0.060	–	0.344	0.062
	*AgrLabInput*4	0.084	0.165	0.344	–	0.360
	*AgrIncAWU*5	0.032	0.002	0.062	0.360	–

*OutputValue*1 – output value of agricultural industry, change 2010–2016, 2010 = 100%; *GValAdded*2 – gross value added, 2010–2016, 2010 = 100%; *SubsidProd*3 – subsidies on production, 2010–2016, 2010 = 100%; *AgrLabInput*4 – agricultural labour input (thousand annual working unit (AWU)), 2010 = 100%; *AgrIncAWU*5 – agricultural income per AWU, 2010–2016, 2010 = 100%; numbers are bolded by the authors based on the SPSS statistical analysing system, marked numbers mean strong or medium-strong correlations among the economic variances, these correlations can occur in cases, when the values are close to 0.500 (50%) or higher than this level

Source: own calculation based on Eurostat (2018b): Economic Accounts for Agriculture (EAA) – dataset aact_ali01

nia, 3.2% in Cyprus; in Bulgaria, the *GValAdded*2 increased by 31.0% and *SubsidProd*3 also increased by 32.3%. In those member states of EU-12, where the *OutputValue*1 and *GValAdded*2 considerably increased, the *SubsidProd*3 decreased in the same period. For example the *GValAdded*2 increased by 74.2% in Hungary at the top level in the Central-East Europe, while *SubsidProd*3 increased less (only by 3.6%). Slovakia ranked second with an increase of *GValAdded*2 by 73.4% but the *SubsidProd*3 increased only by 12.7%. In the Czech Republic, the *GValAdded*2 increased considerably by 64.6% but the *SubsidPro3* increased only by 6.9%. It can be declared that the subsidies were lower for those EU-12 member states, where the *OutputValue*1 and *GValAdded*2 were considerably high (Tables 1–2) (Eurostat 2018a). Subsidies on production were given to those member states EU-12, where the output value of agricultural industry and agricultural gross value added have considerably decreased or increased less than in the other member states, for example Estonia, Croatia, Cyprus and Romania.

Therefore the *OutputValue*1 and *GValAdded*2 partly increased by increasing subsidies, but also the considerable concentration of the agricultural labour input (*AgriLabInput4*) was observed in Central-East-Europe. Therefore the agricultural income per annual working unit (*AgrincAWU*5) could have increased by 20.5% for 2010–2016. The subsidies on production were necessary to increase the agricultural output value of EU-12. In Bulgaria, *AgrIncAWU*5 was at the top level by 46.9%, as compared to EU-28 by 8.2% and EU-12 by 20.5%; yet the *GValAdded*2 increased mostly same as *SubsidProd*3 and the *AgriLabInput*4 decreased first by 36.8% in EU-12 for 2010–2016, which could lead to an increase of the *AgrIncAWU*5 (Table 4) (Eurostat 2018b,c,d,e).

The EU-12 achieved a higher increase of the output value of agricultural industry, the productivity of input and agricultural gross value added for 2010–2016 comparably for 2005–2010. Also the output value of agricultural industry per agricultural AWU increased by 23.0% in EU-12, more than 18.5% in EU-28, the agricultural gross value added per AWU by 25.1% in EU-12, but in EU-28 only by 16% (Tables 4–5) (Eurostat 2018b,c,d,e). Therefore, the agricultural income per annual working unit (AWU) increased in EU-12 more compared to the average results of EU-28 for the period of 2010–2016 (Table 4).

The output value of agricultural industry and agricultural gross value added per intermediate consumption (input) decreased by 1.35% and 3.3% as the productivity of input decreased, but factor income – net value added at factor cost – per intermediate consumption (input) increased by 0.1%, because of the subsidies on production that increased by 3.4% for the period of 2010 and 2016. In EU-28, the fac-

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Table 4. Agricultural labour input and agricultural income per annual working unit (AWU), in 2010–2016, 2010 = 100%

Member States	Agricultural labour input (thousand number AWU) 2016 (2010 = 10 345 thousand in EU-28)	Change of labour input 2010–2016 (%, 2010 = 100)	Agricultural income per AWU (%)	
			2010–2016 (2010 = 100)	2016
EU-28	**9 490.0**	**–8.3**	**108.2**	**109.3**
Bulgaria	256.8	–36.8	146.9	188.2
Czech Republic	104.5	–4.0	135.9	155.1
Estonia	20.3	–20.0	114.2	65.2
Croatia	174.0	–13.9	95.6	117.7
Cyprus	20.9	–17.9	103.4	125.8
Latvia	76.3	–11.2	111.7	120.3
Lithuania	148.8	3.8	132.8	120.5
Hungary	434.3	–2.2	144.4	163.3
Poland	1 675.8	–12.5	108.9	125.2
Romania	1 592.0	–2.9	113.5	118.1
Slovenia	80.0	3.8	103.5	104.9
Slovakia	48.7	–13.2	134.6	173.2
EU-12	4 632.4	–10.6	120.5	131.5
EU-12 of EU-28 (%)	**48.8**	–	–	–

Source: Eurostat (2018b,c,d,e)

tor income per agricultural AWU increased by 21% for the same period, but mostly, this income should be covered for developing agricultural production technology, mainly for mechanization (consumption of fixed capital) (Tables 6–7) (Eurostat 2018b,c,d,e) (Alekneviciene et al. 2018).

Based on the SPSS in Figure 1 (Eurostat 2018b), in some countries, namely Lithuania, Latvia, Hungary and Czech Republic in the first quarter session from *origo* to the right–up side at the principle line "X" in the Component-1: *OutputValue*1, *GValAdded*2 and *AgrIncAWU*5 economic variances generally increased or less decreased, while the (minus) *SubsidProd*3 decreased in these countries. Similarly, at the principle line "Y" in the Component-2: *AgrLabInput*4, economic variance increased in these countries.

Table 5. Output value of agricultural industry and agricultural gross value added per agricultural annual working unit (AWU) in selected EU member states in 2010–2016

Member states	Output value per agricultural AWU		Gross value added per agricultural AWU	
	2016 (thousand EUR)	2010–2016 (%, 2010 = 100)	2016 (thousand EUR)	2010–2016 (%, 2010 = 100)
Bulgaria	15.60	65.90	6.90	109.90
Czech Republic	47.00	26.00	15.20	71.40
Estonia	37.00	8.20	7.44	–20.00
Croatia	12.60	–12.50	5.50	–20.00
Cyprus	32.80	21.50	14.60	18.00
Latvia	17.30	8.10	4.30	7.20
Lithuania	19.00	32.90	6.70	49.00
Hungary	19.10	38.60	7.90	75.50
Poland	13.40	29.80	5.10	19.20
Romania	9.70	4.30	4.10	2.70
Slovenia	15.10	5.60	5.93	14.00
Slovakia	49.10	26.50	12.90	101.60
EU-28	**42.70**	**18.50**	**17.40**	**16.40**
EU-12	**14.35**	**23.00**	**5.57**	**25.10**

Source*:* own calculation based on Eurostat (2018b,c,d,e)

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In Romania, Slovenia or Poland in the second quarter session from *origo* to the left-up side at the principle line "X" in the Component-1: *OutputValue*1, *GValAdded*2 and *AgrIncAWU*5 economic variances decreased or less increased, while the (minus) *SubsidProd*3 increased in these countries. At the principle line "Y" in the Component-2: *AgrLabInput*4 economic variance increased in these countries.

In Slovakia and Bulgaria in the third quarter session from *origo* to the right-down side at the principle line "X" in the Component-1: *OutputValue*1, *GValAdded*2 and *AgrIncAWU*5 economic variances increased or less decreased, while the (minus) *SubsidProd*3 decreased in these countries. Yet, at the principle line "Y" in the Component-2: *AgrLabInput*4 economic variance decreased in these countries. In Cyprus, Croatia and Estonia in the fourth quarter session from *origo* to the left-down side at the principle line "X" in the Component-1: *OutputValue*1, *GValAdded*2 and *AgrIncAWU*5 economic variances decreased or less increased, while the (minus) *SubsidProd*3 is increased in these countries. Also at the principle line "Y" in the Component-2: *AgrLabInput*4 economic variance decreases or little increases in these countries (Figure 1, Tables 3–4) (Eurostat 2018b,c,d,e).

Figure 2 shows that the EU-12 member states separated into five country groups: 1 – Bulgaria; 2 – Czech Republic, Hungary, Latvia, Lithuania, Slovakia; 3 – Cyprus, Estonia, Poland; 4 – Croatia; and the final 5 – Romania, Slovenia. The SPSS system selected these countries based on their economic conditions, as their owned economic variances.

In Hungary the *GValAdded*2 increased by 74.2% at top level in EU12, which was result of increasing

Table 6. Main components of agricultural industry in EU-28, 2010–2016

Titles	2010 (million EUR)	2016 (million EUR)	Change 2010–2016 (%, 2010 = 100)	Share in output value of agricultural industry, 2016 (%)
Output of agricultural industry	372 902	405 008	8.6	100.0
Crop output	188 875	210 282	11.3	51.9
Animal output	142 345	158 873	11.6	39.2
Agricultural services	17 693	20 104	13.6	5.0
Secondary activities	23 989	15 750	–34.3	3.9
– intermediate consumption (input)	217 309	239 355	10.1	59.1
Gross value added	155 593	165 654	6.5	40.9
– consumption of fixed capital	69 401	60 803	–5.4	–
– tax on production		4 877		–
+ subsidies on production	50 917	52 628	3.4	–
= factor income	137 109	152 603	11.3	–
Growth rate (%, 2010 = 100)	100.0	111.3	–	–

production value at basic price, 2010 = 100%; volume index for labour costs – change in total labour input measured in 1 000 AWU (annual working unit) (Eurostat 2018b); correction of the weight for labour costs to cover the family labour costs – the compensation of employees is divided by the share of paid labour also directly available from the EAA (Eurostat 2018b); the Farm Accountancy Data Network to estimate the national average depreciation rate; TFP index is defined as the ratio between the output index (i.e. the change in production volumes over a considered period) and the input index (the corresponding change in inputs/factors used to produce them), the four considered production factors (intermediate inputs, land, labour, capital)

agricultural factor income measures the remuneration of all factors of production (land, capital, labour) regardless of whether they are owned or borrowed/rented and represents all the values generated by a unit engaged in an agricultural production activity. It corresponds to the net value added at factor cost

the indicator consists of two sub-indicators: A. Agricultural factor income per annual work unit (AWU), AWU in agriculture corresponds to the work performed by one person who is employed at an agricultural holding on a full-time basis, for this indicator, total (paid and unpaid) AWU is used; B. The index of agricultural factor income per AWU is already available in the Eurostat's Economic Accounts for Agriculture as Indicator A, this index is particularly suited to show developments over time

total factor productivity (TFP) compares total outputs relative to the total inputs used in the production of the output; as both outputs and inputs are expressed in term of volume indices, the indicator measures the TFP growth

Source: Eurostat (2018b) – last update March 3, 2018, there are not data for factor income of each EU member state for 2010–2016

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Table 7. Output value of agricultural industry, agricultural gross value added, subsidies on production, factor income per intermediate consumption (input) and AWU in EU-28 and output value, GVA and subsidies per AWU in EU-28 and EU-12, between 2010 and 2016

	2010	2016	2010–2016 (%, 2010 = 100)
Output value of agricultural industry per intermediate consumption (input, billion EUR)			
EU-28	1.715	1.692	–1.35
EU-12	1.617	1.634	1.05
Agricultural gross value added per intermediate consumption (input, billion EUR)			
EU-28	0.716	0.692	–3.30
EU-12	0.617	0.634	2.70
Subsidies on production (billion EUR)			
EU-28	50.900	52.600	3.40
EU-12	9.150	11.450	25.10
Factor income (net value added at factor cost) per intermediate consumption (input, billion EUR)			
EU-28*	0.631	0.637	0.10
Factor income per agricultural annual working unit (AWU, thousand EUR)			
EU-28*	13.300	16.080	21.00
Output value of agricultural industry per agricultural annual working unit (AWU, thousand EUR)			
EU-28	36.040	42.650	18.30
EU-12	11.660	14.350	23.00
Agricultural gross value added (GVA) per agricultural annual working unit (AWU, thousand EUR)			
EU-28	15.040	17.440	16.00
EU-12	4.450	5.570	25.10
Subsidies on production per agricultural annual working unit (AWU, thousand EUR)			
EU-28	4.920	5.540	12.60
EU-12	1.800	2.500	38.10

*there are not data for factor income of each EU member state for 2010–2016

Source: own calculation based on the statistical data coming from Eurostat (see Tables 1–2, 6), Eurostat (2018b,c,d,e)

productivity of input by 15.7%. It was 12% in the Czech Republic, where *AgrincAWU*5 increased at second highest level in EU-12 (by 35.9%) after Bulgaria (by 46.9%) in the same period, in Bulgaria the number of *AgriLabInput4* only decreased by 36.8%. The latter and the output values resulted from mechanization, technological development, know-how use, increasing skilled level of working units and management experience. Similarly, the conditions and reasons for the third and fourth biggest increase of *AgrincAWU*5 by 35.9% in Czech Republic and 34.6% were in Slovakia (Tables 3–4) (Eurostat 2018b,c,d,e).

In Poland and Romania, the amount of the agricultural labour input was 70.5% of AWU in EU-12 and 34.4% of AWU in EU-28 (Table 4), the annual working unit being 3267.8 thousand by the end of 2016. This shows that two countries have considerable AWU as agricultural labour input. The main difficulty in both countries is a lower concentration of agricultural production in AWU; therefore, in farm structure the land is also separated into many small farms, which leads to a decreasing trend of productivity of input in the two countries (Table 1) (Eurostat 2018a). Technological development has thus backwardness in the two countries. In spite that in EU-12 the decrease of AWU amount has been considerable (by 10.6%) for 2010–2016, this could not change the farm structure in essence. In Romania, the farm structure is even less favourable than in Poland; the mechanization is more backward and underdeveloped there compared to Poland (Drost 2013).

CONCLUSION

The EU-12 achieved a higher increase of output value of agricultural industry and agricultural gross value added, more than average results of EU-28, while these values per agricultural annual working unit (AWU) and agricultural income per AWU increased more in EU-12 than in EU-28 for the period of 2010–2016. In EU-12, the growth of output value and GVA was a result of concentration of agricultural production

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in less farms, modernization and mechanization in the sector, increasing productivity of input and factor income per AWU, better price income, better market conditions and increasing subsidies on production.

Subsidies on production ensured higher agricultural income per AWU and factor income per agricultural AWU. Despite EU-12 had more subsidies on production than the average level in EU-28, only 21.7% of all subsidies of EU-28 were payed for EU-12. The agricultural income per AWU in EU-12 increased more compared to the average level of EU-28. In EU-28, the output value of agricultural industry and agricultural gross value added per intermediate consumption (input) decreased, but factor income – net value added at factor cost – per AWU increased by 21% because of the subsidies on production that increased for the period of 2010 and 2016.

In EU-28 subsidies on production were concentrated on developing technology by subsiding consumption of fixed capital. Generally, the value of subsidies was 87% of value of consumption of fixed capital in 2016. The intermediate consumption (input) increased more than the output of agricultural industry, which can lead to the income loss of AWU for 2010–2016. Therefore, also the subsidies on production should little compensate this income loss of AWU. Finally, these subsidies have mostly covered only the decreasing rate of agricultural gross value added per input in EU-28 for 2010–2016.

In EU-12 the farm structure concentration increased more than in EU-28 by decreasing agricultural labour input, therefore in EU-12 the agricultural income per AWU increased more than in EU-28 for the same period. In spite of this considerable increase, the income level of AWU in EU-12 remains lower than the level of EU-28.

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