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The level and determinants of work profitability changes in the Czech and Polish agricultural sector in the years 2004–2014

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Abstract: The main aim of the study was to analyse changes in the work profitability in the agricultural sector in the Czech Republic and Poland in the post-accession period. The study used the Economic Accounts for Agriculture, which enabled the analysis of the economic situation in agriculture according to the uniform standards. The study was based on a system of work profitability indexes and factor analysis. The research proved that during the post-accession period (2004–2014), in the average work profitability in agriculture increased in the real terms by 6.69% per annum in the Czech Republic and by 5.66% per annum in Poland. As results from the factor analysis, favourable changes in the work profitability in the agricultural sector in the Czech Republic were chiefly caused by an increase in subsidies, a higher productivity and depreciation costs. On the other hand, the increased productivity and subsidies were the main causes of favourable changes in the work profitability in the agricultural sector in Poland.

Key words: Economic Accounts for Agriculture, Czech Republic, Poland, work profitability in agriculture

The need to make fundamental improvements in the economic and financial efficiency, which is measured by the productivity and work profitability, is one of major problems faced by agriculture in the Central and Eastern European countries. The need for changes in this sector results from two fundamental premises. First of all, the low productivity and the resulting low work profitability are essential barriers to the transformation to the intensive pathway of economic growth. Second, these are changes in the productivity and work profitability that will be decisive both to the dynamics and the costs of integration on the European and global scale as well as to the degree of elimination of the distance in the socioeconomic development.

The accession of the Central and Eastern European countries to the European Union (EU) and the application of the instruments of the Common Agricultural Policy (CAP) in the agricultural sectors in these countries fundamentally changed the conditions of their functioning. The membership in the EU structures provides an unlimited access to a huge market. There is another vital advantage of the EU membership for agricultural producers, as due to the size of the EU market, it creates new opportunities to generate income and to receive subsidies under the CAP (Zegar 2008; Poczta et al. 2009; Gołaś 2010, 2014).

The main aim of this article was to present a systemic analysis of the conditions of changes in the work profitability in the post-accession period in two extremely structurally different agricultural sectors in Poland and the Czech Republic. The problem was considered in the context of the Economic Accounts for Agriculture (EAA) and in the context of the agricultural entrepreneurs' income per unpaid employment unit, which is a basic indicator of profitability in the agricultural sector. The article has the following structure. The first part discusses the source materials and methodological assumptions. It presents a calculation of generating income based on the Economic Accounts for Agriculture and the concept of the systemic analysis of work profitability in agriculture. The second part presents the research findings, including: an analysis of generating agricultural entrepreneurs' income based on the EAA and a factor analysis of the work profitability in the agricultural sectors in Poland and the Czech Republic based on the proposed system of indicators.

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MATERIAL AND METHODS

The research was based on the Economic Accounts for Agriculture (EAA), i.e. the harmonised financial statements applicable in the EU, which enable the analysis of the economic situation in agriculture according to uniform rules (Regulation EC ... 2004; Economic Accounts ... 2014). The Economic Accounts for Agriculture are commonly used in different analyses of the agricultural sectors in the EU countries, especially in the new EU member-states (see Blaas 2003; Blaas and Varoščák 2006; Poczta et al. 2009; Gołaś 2010, 2014; Vavřina et al. 2012; Spicka 2013).

One of the main goals of the EAA is to monitor income in agriculture, which is perceived in the categories of the gross and net value added, the income from factors of production, operating surplus and the net agricultural entrepreneurial income. In the EAA, the gross and net value added are measures of the value (income) generated by all agricultural entities, corrected by the internal consumption and the fixed assets consumption (depreciation). On the one hand, they are the basic income categories providing information about the capacity to bring new values in relation to the material costs borne. On the other hand, they are perceived in the context of the quality and quantity of human capital, which has an increasing influence on this capacity (Skoczylas and Niemiec 2005; Wędzki 2006). However, due to the fact that in the agricultural sector, the output is estimated at the base prices and the intermediate consumption is estimated at the purchasers' prices, the net value added is cleared of the taxes on products, but it includes the amounts of subsidies to products.

On the other hand, when the net value added is reduced by the amount of other taxes on production and when other production subsidies are added to it, we receive another income category, which is defined as the value added in the costs of the factors of production – the income from factors of production. This income category is a measure of the value generated by all factors of production, such as land, capital and labour. The labour factor is shown in the form of all labour resources engaged in the agricultural activity (agricultural entrepreneurs' own work and hiring of labour).

The diversification in the employment structure in agriculture can be seen in another income category, i.e. the net operating surplus (mixed income). It measures the value generated by land, capital and unpaid labour, so it is less than the value added in the costs of factors of production as it is reduced by the costs of salaries for the hired labour.

The last component of the EAA is the net agricultural entrepreneurial income. Its value is calculated by correcting the operating surplus with the balance of interests and the farm and land lease costs. The net agricultural entrepreneurial income is a synthetic measure of the level of remuneration for the unpaid labour resources, the remuneration for the capital employed and the rent for the land ownership.

The main aim of the study is to research the strength and direction of the influence of the selected factors on work profitability in agriculture. Due to the high degree of synthesis in this income category, it is somehow naturally necessary to use the EAA analysis with a systemic approach. This approach respects the superiority and inferiority of the individual economic categories and their key or accessory character, and most importantly, it enables the quantification of the cause-and-effect dependences by constructing systems of structural indicators (pyramids of indicators) and the application of quantitative methods (Wędzki 2006; Skoczylas 2007).

In the systemic approach, the work profitability in the agricultural sector can be shown as the following basic (1) and detailed (2) equations (Gołaś 2010, 2014):

$$\frac{AEI}{UEM} = \frac{GVA}{TEM} \times \frac{AEI}{GVA} \times \frac{TEM}{UEM} \quad (1)$$

$$\frac{AEI}{UEM} = \frac{GVA}{TEM} \times \frac{NVA}{GVA} \times \frac{NVA - TX}{NVA} \times \frac{FI}{NVA - TX} \times \frac{OS}{FI} \times \frac{OS + BI}{OS} \times \frac{AEI}{OS + BI} \times \frac{TEM}{UEM} \quad (2)$$

where:

AEI/UEM – work profitability indicator [agricultural entrepreneurial income (AEI)/number of unpaid employees (UEM)], GVA/TEM – labour productivity indicator measured by the gross value added [gross value added (GVA)/total number of employees (TEM)], NVA/GVA – indicator of costs of the depreciation of fixed assets [net value added (NVA)/gross value added (GVA)], (NVA – TX)/NVA – tax costs ratio [(net value added (NVA) – taxes (TX))/net value added (NVA)], FI/(NVA – TX) – indicator of subsidies to agricultural production [factor income (FI)/(net value added (NVA) – taxes (TX))], OS/FI – indicator of payroll expenses [operating surplus (OS)/factor income (FI)], (OS + BI)/OS – indicator of the financial income and expenses [(operating surplus (OS) + balance of re-

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ceived and paid interest (BI))/operating surplus (OS)], AEI/(OS + BI) – indicator of the lease costs [agricultural entrepreneurial income (AEI)/(operating surplus (OS) + balance of the received and paid interest (BI))], TEM/UEM – indicator of the employment resources structure [total number of employees (TEM)/number of unpaid employees (UEM)].

In the basic Equation (1), the work profitability is perceived as a system of three factors, i.e. the work profitability, the share of agricultural entrepreneurs' income in value added and in the employment structure. On the other hand, if we include depreciation costs in the work profitability indicator measured with the gross value added and if we disaggregate the indicator of the share of agricultural entrepreneurs' income in net value added, thework profitability can be presented in the form of an eight-factor detailed Equation (2). The detailed approach analyses such factors as: changes in the work profitability in the perspective of changes in productivity, depreciation costs, tax costs, production subsidies, remuneration costs, financial costs and income, lease costs and changes in the employment structure in the agricultural sector.

The quantitative analysis of changes in the work profitability in the agricultural sectors in Poland and the Czech Republic is based on the factor analysis – the logarithmic method (Gołaś 2010, 2014). The application of this deterministic method enabled the investigation of the dependence between the work profitability indicator and the factors determining profitability. Apart from that, it enabled the concretisation of the strength and direction of the influence of these factors to work profitability (Ćwiąkała-Małys and Nowak 2005; Skoczylas and Niemiec 2005; Skoczylas 2007). If we make a simplified assumption that the work profitability indicator W_1 from the period t_1 is a function of the product of only three factors (x_1, y_1, z_1), i.e. $W_1 = x_1 \times y_1 \times z_1$, and the synthetic indicator of the work profitability in agriculture (W_0) from the period t_0 is a function of the product of three factors (x_0, y_0, z_0), i.e. $W_0 = x_0 \times y_0 \times z_0$, and simultaneously, it is a point of reference for changes, the following procedure is applied in the logarithmic method:

(1) Calculation of the absolute deviation (ΔW) of the indicator of work profitability in agriculture:
$\Delta W = W_1 - W_0 = x_1 \times y_1 \times z_1 - x_0 \times y_0 \times z_0$

(2) Calculation of partial deviations (ΔW_x, ΔW_y, ΔW_z), which provide information about the influence of factors x, y, z on changes in the indicator of work profitability in agriculture (W):

$$\Delta W_x = \Delta W \times \frac{\log \frac{x_1}{x_0}}{\log \frac{W_1}{W_0}} \qquad \Delta W_y = \Delta W \times \frac{\log \frac{y_1}{y_0}}{\log \frac{W_1}{W_0}}$$

$$\Delta W_z = \Delta W \times \frac{\log \frac{z_1}{z_0}}{\log \frac{W_1}{W_0}}$$

(3) Comparison of the amount of the absolute deviation of the indicator of work profitability in agriculture (ΔW) with the sum of partial deviations of the factors – partial indicators of the system (ΔW_x, ΔW_y, ΔW_z) in order to verify the correctness of calculations according to the formula: $\Delta W = \Delta W_x + \Delta W_y + \Delta W_z$

(4) Substantive interpretation of partial deviations, i.e. determining the impact of changes of the factors (partial indicators) on changes of the synthetic indicator of work profitability in agriculture based on partial deviations and/or the percentage of the individual deviations in the sum of partial deviations.

RESULTS AND DISCUSSION

Table 1 shows the basic EAA categories for the agricultural sector in the Czech Republic in the period before (2001–2003) and after the accession to the EU (2004–2014), including the information on the employment level and structure and the level of work profitability measured by the relation between the agricultural entrepreneurial income per unit of unpaid labour resources. As results from the data in Table 1, between 2004 and 2014 the income of the agricultural sector in the Czech Republic, measured by the value of output at the producers' prices, made an average yearly increase of 0.80% in the real terms. As a result, in 2014 (4006 million euros), it was only about by 8% higher than in 2004 (3700 million euros). The generally low dynamics of changes in the output at the producers' prices in the post-accession period is also shown by comparison of this production category with the period before the accession. The average production between 2004 and 2014 was only by 0.3% higher than the production between 2001 and 2003. In consequence of the reduced subsidies to products, there was even lower dynamics of changes in the output at the base prices. In the post-accession period, the value of subsidies to products decreased from 170.3 million euros to 23.2 million euros. Consequently, in the real terms the average yearly income at the base prices increased only by 0.4%.

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On the other hand, there were noticeable unfavourable trends in changes in the gross value added. Between 2004 and 2014, it fluctuated considerably and ranged from 769 million euros (2010) to 1370 million euros (2004). It is generally noticeable that the average yearly dynamics of changes in the gross value added in the real terms was negative (–1.32%). When we compare it with the average yearly dynamics of changes in the income at the base prices, it is noticeable that the efficiency of the intermediate consumption decreased. Changes in the net value added also point to unfavourable tendencies. As a

Table 1. Economic Accounts for Agriculture – the agricultural sector in the Czech Republic (million EUR, values at real prices 2005)

Components of EAA	average 2001–2003	2004	2006	2008	2010	2012	2014[1]	average 2004–2014	ΔAAR[2] 2004–2014 (%)	2004–2014/ 2001–2003 (%)
Output at producer price	3 589.6	3 700.8	3 322.3	3 720.6	3 193.0	3 805.5	4 006.7	3 599.6	0.80	100.3
Subsidy on products	18.0	170.3	94.5	77.1	39.0	19.7	23.2	60.3	–18.09	334.5
Taxes on products	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	–	–
Output at basic prices	3 607.6	3 871.1	3 416.7	3 797.7	3 231.9	3 825.2	4 029.8	3 659.9	0.40	101.4
Intermediate consumption	2 529.9	2 500.4	2 465.5	2 819.0	2 462.2	2 761.5	2 829.5	2 633.7	1.24	104.1
Gross value added	1 077.7	1 370.8	951.2	978.7	769.7	1 063.7	1 200.3	1 026.2	–1.32	95.2
Fixed capital consumption	394.4	395.1	451.1	463.2	449.0	470.1	485.1	454.4	2.07	115.2
Net value added	683.3	975.7	500.1	515.5	320.7	593.6	715.2	571.8	–3.06	83.7
Taxes on production	58.3	61.9	48.9	37.8	43.0	38.1	36.2	43.4	–5.23	74.5
Subsidies on production	226.5	239.4	705.7	810.9	845.6	916.4	933.8	760.7	14.58	335.8
Factor income	851.5	1 153.2	1 156.9	1 288.6	1 123.3	1 471.8	1 612.8	1 289.0	3.41	151.4
Compensation of employees	765.6	758.1	789.3	826.2	755.5	776.9	794.6	780.8	0.47	102.0
Operating surplus	85.9	395.1	367.6	462.5	367.8	694.8	818.2	508.3	7.55	591.7
Rent paid	74.2	85.9	108.4	114.5	119.8	141.2	167.5	123.8	6.90	166.9
Interest paid	56.2	46.4	52.4	45.8	22.9	55.9	41.3	45.8	–1.17	81.6
Interest received	21.2	23.1	21.5	19.4	15.6	13.2	14.9	16.9	–4.28	79.9
Enterpreneurial income	–23.2	285.9	228.4	321.6	240.8	511.0	624.4	355.6	8.13	1 631.6
Total agricultural labour input (thous. employ.)	158.6	144.9	133.1	120.7	108.8	105.8	105.1	119.1	–3.16	75.1
Non-salaried agricultural labour input (thous. employ.)	24.3	24.4	27.2	27.8	26.2	25.8	27.9	26.7	1.35	110.1
Work profitability (thous.€/ non-salaried employ.)	–1.00	11.72	8.40	11.57	9.19	19.81	22.38	13.28	6.69	1 406.5
The share of subsidies in income (%)	–135.0	143.3	350.4	276.1	367.3	183.2	153.3	310.2	0.67	329.7

[1]preliminary data, [2]ΔAAR = average annual rate of change

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result of the increasing depreciation costs (2.07%), there was a more rapid average yearly decrease in the net value added (–3.06%) than in the gross value added (–1.32%).

As far as the direction and dynamics of changes are concerned, the income in the agricultural sector in the Czech Republic was favourably influenced by the changes in taxes on production, especially by the changes in subsidies to production. As results from the data in Table 1, in average the level of taxes changed by 5.23% a year, whereas the average yearly increase in subsidies was as high as 14.58%. In consequence of these changes, there was a considerable increase in the income from the factors of production. In comparison with the pre-accession period, the average value of this income category increased by 51.4% after the accession and it changed at an average rate of 3.41% per year.

During the whole post-accession period, the income in the agricultural sector in the Czech Republic was comparably determined by the remuneration costs. These costs did not change much and in average they only increased by 0.47% per year. The low dynamics of changes in the remuneration costs resulted in a significantly more rapid average yearly increase in the operating surplus (7.55%) than in the income from the factors of production (3.41%).

During the post-accession period, the income situation in the agricultural sector in the Czech Republic was decreasingly determined by financial costs and income. It was also increasingly determined by the lease costs. In average, the interest paid and received decreased by 1.17% and 4.28% per annum, respectively, whereas the lease costs increased by 6.90%. However, in general, the changes in these categories were much less dynamic than the changes in the operating surplus, which resulted in a much more rapid increase in the agricultural entrepreneurs' income. As results from the data in Table 1, in average the income increased by 8.13% per annum. In 2014, it was more than by 118% higher (624.4 million euros) than in 2004 (285.9 million euros). This scale of changes in the agricultural entrepreneurs' income definitely indicates that there was an enormous improvement in the income situation in the agricultural sector in the Czech Republic. This observation is additionally strengthened by the negative level of this category before the accession.

The issue of changes in the level and structure of employment in agriculture cannot be neglected. As results from the study, between 2004 and 2014 the total employment in the agricultural sector in the Czech Republic decreased (in average by 3.16% per annum), but the number of unpaid employees increased (in average by 1.35% per annum). Although the dynamics of the increase in the number of agricultural entrepreneurs was noticeably lower than the dynamics of the increase in income, it did not disturb a very favourable tendency in the work profitability. There was a rapid rate of increase in the work profitability in the post-accession period (in average by 6.69% per annum). In 2014 (22.38 thousand euros) it was more than by 90% higher than in 2004 (11.72 thousand euros). Thus, there were considerable and favourable changes in the income situation of agricultural entrepreneurs in the Czech Republic. Nevertheless, it is necessary to stress the fact that the income is increasingly determined by the instruments of the Common Agricultural Policy (CAP) in the form of subsidies. During the period under analysis, in all the years the relation between the subsidies (and products and production) and the agricultural entrepreneurs' income exceeded 100%, whereas in 2006 and 2010 it even exceeded 350%. This means that the agricultural sector in the Czech Republic would have generated a high loss without the subsidies.

Table 2 shows the results of the factor analysis of the work profitability in the agricultural sector in the Czech Republic between 2004 and 2014. As results from the values and structure of deviations of the factors included in the analysis, it is noticeable that during the period under study, there were different effects of changes in the deviations on changes in the work profitability. However, in general, if we use the agricultural entrepreneurs' income to measure the work profitability in agriculture in the Czech Republic between 2004 and 2014, three factors should be considered as the main causes of changes in the work profitability. First of all, these were the changes in subsidies to agriculture [FI/(NVA–TX)]. They increased the factor income on a diversified but significant scale and thus they were decisive to the increase or decrease in the work profitability. Second, there were favourable changes in productivity [GVA/TEM], which began to increase noticeably in 2009. Third, the changes were caused by the costs of the depreciation of fixed assets (NVA/GVA), which were increasing faster than the gross value added and they were decisive to the negative tendency of changes in the net value added. As results from the logarithmic method and the sum of deviations, between 2004 and 2014 the changes in the subsidies, productivity and

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depreciation costs determined the changes in the work profitability by 31.78%, 16.14% and 16.03% in average, respectively. Thus, these factors explained the changes in the work profitability in the agricultural sector in the Czech Republic by more than 63%.

Table 3 shows the basic EAA categories for the agricultural sector in Poland in the period before (2001–2003) and after the accession to the EU (2004–2014), including the information on the employment level and structure and the level of work

Table 2. Factor analysis of changes in the work profitability (AEI/UEM) in the Czech agriculture in 2005–2014 years

Years	GVA/TEM	NVA/GVA	NVA–TX/NVA	FI/NVA–TX	OS/FI	OS+BI/OS	AEI/OS+BI	TEM/UEM	AEI/UEM
	value of ratios								
2004	9.46	0.71	0.94	1.26	0.34	0.94	0.77	5.94	11.72
2005	7.19	0.56	0.91	2.25	0.32	0.91	0.70	5.55	9.43
2006	7.15	0.53	0.90	2.56	0.32	0.92	0.68	4.89	8.40
2007	8.54	0.58	0.93	2.15	0.37	0.95	0.74	4.35	11.08
2008	8.11	0.53	0.93	2.70	0.36	0.94	0.74	4.34	11.57
2009	5.18	0.26	0.74	8.84	0.24	0.88	0.42	4.34	3.34
2010	7.07	0.42	0.87	4.04	0.33	0.98	0.67	4.15	9.19
2011	10.61	0.58	0.94	2.42	0.48	0.96	0.80	4.08	21.27
2012	10.05	0.56	0.94	2.65	0.47	0.94	0.78	4.10	19.81
2013	10.94	0.58	0.95	2.33	0.47	0.94	0.76	3.77	17.87
2014	11.42	0.60	0.95	2.38	0.51	0.97	0.79	3.77	22.38
	partial deviations								
2005/2004	–2.896	–2.454	–0.339	6.086	–0.635	–0.299	–1.026	–0.721	–2.28
2006/2005	–0.049	–0.622	–0.046	1.167	–0.134	0.014	–0.253	–1.114	–1.04
2007/2006	1.720	0.904	0.271	–1.709	1.451	0.307	0.877	–1.140	2.68
2008/2007	–0.583	–1.039	–0.014	2.574	–0.319	–0.033	–0.076	–0.020	0.49
2009/2008	–2.972	–4.745	–1.463	7.859	–2.719	–0.488	–3.705	–0.001	–8.23
2010/2009	1.805	2.786	0.885	–4.519	1.843	0.650	2.660	–0.256	5.86
2011/2010	5.834	4.802	1.165	–7.367	5.557	–0.364	2.686	–0.238	12.07
2012/2011	–1.104	–0.851	–0.072	1.825	–0.414	–0.375	–0.551	0.081	–1.46
2013/2012	1.587	0.855	0.237	–2.445	–0.074	–0.002	–0.491	–1.598	–1.93
2014/2013	0.865	0.405	0.038	0.410	1.521	0.617	0.650	0.000	4.51
	structure of partial deviations[1] (%)								
2005/2004	20.04	16.98	2.35	42.10	4.39	2.07	7.10	4.99	100
2006/2005	1.43	18.31	1.36	34.34	3.93	0.41	7.44	32.78	100
2007/2006	20.53	10.79	3.24	20.39	17.31	3.67	10.47	13.61	100
2008/2007	12.51	22.30	0.30	55.27	6.85	0.71	1.64	0.42	100
2009/2008	12.41	19.81	6.11	32.81	11.35	2.04	15.47	0.01	100
2010/2009	11.72	18.09	5.75	29.33	11.97	4.22	17.27	1.66	100
2011/2010	20.83	17.14	4.16	26.30	19.84	1.30	9.59	0.85	100
2012/2011	20.94	16.13	1.36	34.61	7.86	7.10	10.46	1.54	100
2013/2012	21.77	11.72	3.26	33.55	1.02	0.03	6.74	21.92	100
2014/2013	19.20	8.98	0.85	9.10	33.75	13.69	14.43	0.00	100
average	16.14	16.03	2.87	31.78	11.83	3.52	10.06	7.78	100

[1]partial structure of the partial deviations was calculated on the basis of the absolute values of partial deviation

Source: own elaboration

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profitability measured by the relation between the agricultural entrepreneurial income per unit of the unpaid labour resources. As results from the data in Table 3, between 2004 and 2014 the income of the agricultural sector in Poland, measured by the value of output at the producers' prices, made an average yearly increase of 2.25% in the real terms. As a result, in 2014 (19 411 million euros), it was by about 25% higher than in 2004 (15 542 million euros). The generally high dynamics of changes in the output at the producers' prices in the post-accession period is also shown by the comparison of this production category with the period before the accession. The average production between 2004 and 2014 was 20.9% higher than the production between 2001 and 2003. However, in consequence of the reduced subsidies to products, there was lower dynamics of changes in the output at the base prices. In the post-accession

Table 3. Economic Accounts for Agriculture – the agricultural sector in Poland (million EUR, values at the real prices 2005)

Components of EAA	average 2001–2003	2004	2006	2008	2010	2012	2014	average 2004–2014	ΔAAR[1] 2004–2014 (%)	2004–2014/ 2001–2003 (%)
Output at producer price	13 999	15 542	14 298	16 589	16 065	19 262	19 411	16 930	2.25	120.9
Subsidy on products	124.7	890.5	1 123.0	927.9	1 093.7	680.0	166.9	855.2	–15.42	686.1
Taxes on products	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	–	–
Output at basic prices	14 124	16 433	15 421	17 516	17 158	19 942	19 578	17 785	1.77	125.9
Intermediate consumption	8 840	9 678	9 220	11 152	10 424	12 188	12 011	10 788	2.18	122.0
Gross value added	5 283.4	6 754.9	6 200.8	6 364.4	6 734.2	7 754.6	7 566.6	6 997.9	1.14	132.4
Fixed capital consumption	1 345.5	1 439.8	1 266.1	1 314.4	1 286.0	1 292.3	1 379.1	1 314.3	–0.43	97.7
Net value added	3 938.0	5 315.1	4 934.7	5 050.0	5 448.2	6 462.3	6 187.5	5 683.6	1.53	144.3
Taxes on production	371.0	350.9	309.1	347.3	262.0	486.8	448.9	363.0	2.49	97.8
Subsidies on production	107.2	1 081.1	1 543.4	1 942.4	2 647.5	2 680.4	2 877.8	2 201.3	10.29	2 054.3
Factor income	3 674.1	6 045.3	6 169.1	6 645.2	7 833.7	8 655.9	8 616.3	7 521.9	3.61	204.7
Compensation of employees	808.8	693.9	700.1	946.7	751.9	818.6	880.6	807.1	2.41	99.8
Operating surplus	2 865.3	5 351.4	5 469.0	5 698.5	7 081.8	7 837.3	7 735.7	6 714.7	3.75	234.3
Rent paid	84.9	86.8	95.9	107.5	97.9	62.4	74.3	89.2	–1.54	105.1
Interest paid	260.8	219.4	291.3	293.6	286.7	270.2	266.4	273.4	1.96	104.8
Interest received	32.3	40.5	37.8	36.2	25.5	33.7	18.9	31.7	–7.36	98.4
Entrepreneurial income	2 551.9	5 085.7	5 119.7	5 333.7	6 722.7	7 538.4	7 413.8	6 383.9	3.84	250.2
Total agricultural labour input (thous. empl.)	2 356.8	2 283.6	2 291.9	2 299.3	1 914.8	1 914.9	1 937.1	2 118.0	–1.63	89.9
Non-salaried agricultural labour input (thous. empl.)	2 217.5	2 151.3	2 161.9	2 155.2	1 803.9	1 803.9	1 809.0	1 989.7	–1.72	89.7
Work profitability (thous.€/non-salaried empl.)	1.15	2.36	2.37	2.47	3.73	4.18	4.10	3.28	5.66	286.3
The share of subsidies in income (%)	9.25	38.77	52.08	53.82	55.65	44.58	41.07	48.10	0.58	520.2

[1]preliminary data, [2]ΔAAR = average annual rate of change

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period, the value of subsidies to products decreased from 890.5 million euros to 166.9 million euros. Consequently, in the real terms the average yearly income at the base prices increased by 1.77%.

There were noticeable favourable trends of changes in the gross value added. The average yearly dynamics of changes in the gross value added in the real terms was 1.14%. When we compare it with the average yearly dynamics of changes in the income at the base prices (1.77%), it is noticeable that the efficiency of the intermediate consumption decreased. Changes in the net value added also point to positive tendencies in the economic and financial efficiency of the agricultural sector in Poland. As a result of the decreasing depreciation costs (2.07%), there was a more rapid average yearly increase in the net value added (1.53%) than in the gross value added (1.14%).

As far as the direction and dynamics of changes are concerned, the income in the agricultural sector in Poland was negatively influenced by the changes in taxes on production, whereas it was strongly positively influenced by the changes in subsidies to production. In average, the level of taxes changed by 2.49% per year, but it was very strongly compensated by subsidies, which increased in average by 10.29% per annum. In consequence of these changes, there was a considerable increase in the income from the factors of production. In comparison with the pre-accession period, the average value of this income category in Poland increased by 104.7% after the accession and between 2004 and 2014 it changed at an average rate of 3.61% a year.

During the post-accession period, there was an increase in the remuneration costs in the agricultural sector in Poland. However, the dynamics of these costs (in average by 2.41% a year) was lower than the dynamics of the income from factors of production. In consequence, the average annual increase in the operating surplus (3.75%) was more rapid than the increase in the income from the factors of production.

After the accession, the income situation of the agricultural sector in Poland was less and less determined by the lease costs, which were decreasing systematically, and thus their influence on the reduction of the operating surplus was decreasing gradually. On the other hand, there was a different influence of the financial costs and income measured by the interest on the reduction of the operating surplus. During the period under analysis, in average the financial costs increased by 1.96% per annum, whereas the income on interest decreased at an average rate of 7.36% per annum. However, the total changes in these components of the EAA did not have any negative influence on the changes in the income. The dynamics of increase in the agricultural entrepreneurs' income (3.84%) was greater than the dynamics of the operating surplus (3.75%). This situation resulted in a considerable increase in the agricultural entrepreneurs' income. In 2014, the value of this income category was by 45.7% higher than in 2004 and in average, in the post-accession period it was more than by 150% higher than in the pre-accession period. Apart from that, the dynamic increase in the agricultural entrepreneurs' income involved a considerable reduction in the employment resources in the agricultural sector in Poland – both in the total approach (in average –1.63% per annum) and in reference to the unpaid labour resources (in average –1.72% per annum). Changes in the employment and its structure combined with the dynamic increase in the agricultural entrepreneurs' income resulted in a considerable increase in the work profitability. In average, the value of this most synthetic measure of profitability increased by 5.66% per annum. In 2014, it was by over 74% higher than in 2004. In average in the post-accession period, it was as much as by over 186% higher than in the pre-accession period. Thus, there were considerable and favourable changes in the income situation of agricultural entrepreneurs in Poland. Nevertheless, it is necessary to stress the fact that the income is increasingly determined by subsidies. In the post-accession period, the share of subsidies in the income of Polish agriculture ranged from 38.77% to 55.65%, whereas before the accession it amounted to only about 9.25%.

Table 4 shows the results of the factor analysis of the work profitability in the agricultural sector in Poland between 2004 and 2014. As results from the values and structure of deviations of the factors included in the analysis, it is noticeable that during the period under study, there were different effects of changes in the deviations on changes in the work profitability. However, in general, if we use the agricultural entrepreneurs' income to measure work profitability in agriculture in Poland between 2004 and 2014, two factors should be considered to be the main causes of changes in the work profitability. First of all, these were the favourable changes in productivity [GVA/TEM], which showed a noticeable rising trend and resulted from the increase in the value added and the reduced employment in agriculture. Second, there were changes in subsidies to agriculture [FI/(NVA–TX)].

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They systematically and considerably increased the factor income and thus they were decisive to the increase in the work profitability. As results from the logarithmic method and the sum of deviations, between 2004 and 2014 the changes in productivity and the subsidies determined changes in the work profitability by 45.11% % and 21.91% in average, respectively. Thus, these factors explained the changes in work profitability in the agricultural sector in Poland by more than 67%.

Table 4. Factor analysis of changes in the work profitability (AEI/UEM) in Polish agriculture in 2005–2014 years

Years	$\frac{GVA}{TEM}$	$\frac{NVA}{GVA}$	$\frac{NVA-TX}{NVA}$	$\frac{FI}{NVA-TX}$	$\frac{OS}{FI}$	$\frac{OS+BI}{OS}$	$\frac{AEI}{OS+BI}$	$\frac{TEM}{UEM}$	$\frac{AEI}{UEM}$
	value of ratios								
2004	2.96	0.79	0.93	1.22	0.89	0.97	0.98	1.06	2.36
2005	2.66	0.78	0.93	1.27	0.87	0.96	0.98	1.06	2.11
2006	2.71	0.80	0.94	1.33	0.89	0.95	0.98	1.06	2.37
2007	3.23	0.83	0.94	1.31	0.89	0.96	0.98	1.07	2.97
2008	2.77	0.79	0.93	1.41	0.86	0.95	0.98	1.07	2.47
2009	2.87	0.80	0.94	1.51	0.88	0.96	0.98	1.07	2.88
2010	3.52	0.81	0.95	1.51	0.90	0.96	0.99	1.06	3.73
2011	4.02	0.83	0.96	1.52	0.92	0.97	0.99	1.06	4.54
2012	4.05	0.83	0.92	1.45	0.91	0.97	0.99	1.06	4.18
2013	4.15	0.84	0.93	1.46	0.90	0.97	0.99	1.07	4.35
2014	3.91	0.82	0.93	1.50	0.90	0.97	0.99	1.07	4.10
	partial deviations								
2005/2004	–0.239	–0.026	–0.020	0.095	–0.033	–0.022	–0.005	–0.003	–0.25
2006/2005	0.040	0.051	0.028	0.108	0.037	–0.009	0.001	0.000	0.26
2007/2006	0.473	0.113	0.018	–0.053	0.011	0.021	0.006	0.017	0.61
2008/2007	–0.421	–0.123	–0.037	0.211	–0.101	–0.018	–0.010	0.000	–0.50
2009/2008	0.095	0.023	0.016	0.185	0.062	0.012	0.010	0.005	0.41
2010/2009	0.671	0.035	0.052	–0.009	0.097	0.014	0.006	–0.023	0.84
2011/2010	0.550	0.125	0.022	0.015	0.065	0.033	0.008	0.000	0.82
2012/2011	0.034	–0.003	–0.150	–0.198	–0.062	–0.005	0.018	0.000	–0.37
2013/2012	0.102	0.012	0.009	0.027	–0.019	0.001	0.002	0.037	0.17
2014/2013	–0.253	–0.091	0.004	0.125	–0.017	–0.009	–0.009	0.000	–0.25
	structure of partial deviations[1] (%)								
2005/2004	54.02	5.80	4.60	21.45	7.51	4.87	1.09	0.65	100
2006/2005	14.43	18.64	10.40	39.60	13.36	3.14	0.44	0.00	100
2007/2006	66.48	15.87	2.58	7.46	1.48	2.96	0.80	2.37	100
2008/2007	45.72	13.39	3.98	22.94	10.97	1.97	1.04	0.00	100
2009/2008	23.21	5.74	3.97	45.29	15.24	2.90	2.46	1.19	100
2010/2009	74.08	3.86	5.77	0.94	10.70	1.53	0.63	2.50	100
2011/2010	67.22	15.27	2.73	1.79	7.91	4.05	1.03	0.00	100
2012/2011	7.14	0.65	31.98	42.16	13.13	1.02	3.88	0.05	100
2013/2012	48.93	5.57	4.36	12.80	9.32	0.42	0.75	17.86	100
2014/2013	49.87	17.99	0.72	24.67	3.26	1.74	1.75	0.00	100
average	**45.11**	10.28	7.11	**21.91**	9.29	2.46	1.39	2.46	100

[1]partial structure of the partial deviations was calculated on the basis of the absolute values of partial deviation

Source: own elaboration

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CONCLUSION

The study resulted in the following final conclusions:

(1) In the post-accession period, there was a dynamic increase in the work profitability in agriculture in the Czech Republic and Poland in the real terms. However, the agricultural sectors in these countries differ significantly in this respect. In the Czech Republic, the work profitability in agriculture was (2014) about 5.5 times greater and it was closely related to the higher productivity, which was nearly three times greater.

(2) As results from the factor analysis, in the post-accession period the main determinants of the increase in the work profitability in agriculture in the Czech Republic were: increased amounts of subsidies, a favourable trend and scale of changes in productivity. On the other hand, in the Polish agricultural sector, the favourable changes in the work profitability chiefly resulted from a higher productivity, whereas increased amounts of subsidies were of secondary importance. However, it should be highlighted that in the post-accession period, in both – Poland and the Czech Republic, a vital influence of subsidies for the work profitability in agriculture have been related to the methodological shift of the payment schemes (resulted in the reduction of product payment schemes and the simultaneous substantial growth of the production payment schemes).

(3) As far as the development perspectives and the competitive potential are concerned, a further improvement of the economic and financial efficiency of Polish agriculture will primarily depend on the progress in productivity. Subsidies will still be very important, but their significance regarding the changes in the work profitability will be stable. In consequence, the potential for a further increase in income in the Polish agricultural sector does not seem to be realistic without the acceleration of the processes of structural changes leading to the increase in the size of basic production entities, the reduction of employment and the acceleration of the rate of the technological reconstruction of agriculture.

(4) The procedure of decomposition of the work profitability indicator presented in this study is a coherent and logical concept showing the cause-and-effect relations between the determinants of the value of the work profitability resulting from the structure of the Economic Accounts for Agriculture. The proposed system of indicators has the following advantages: a coherent and multi-dimensional image of the relations of the work profitability in agriculture and the possibility to measure the quantitative effect of each indicator at the individual levels of the pyramid by the means of deterministic methods. Apart from that, the analytic system of work profitability can be modified and it can include other determinants of changes in its value. The inclusion of other factors, such as the farmland resources or the production intensity, indicates new and important areas of research on the work profitability in agriculture.

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