

FARMS COMPETITIVENESS IN SELECTED COUNTRIES OF CENTRAL AND EASTERN EUROPE

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Abstract

In the conditions of the modern economy, competitiveness is one of the most important components of the assessment of the position of a business in the market. Depending on the sector or industry, competition can take place on many levels, can have different character and varying severity. The problem of farm competition, which was defined as the farm's ability to grow, was addressed in the paper. This capacity was measured using the value of agricultural income generated by the agricultural holding. The competitiveness index (CI) by W. Kleinhans was used in the work. The index measures the real value of agricultural income to the value of own costs of production factors. The purpose of the research was to evaluate the competitiveness of farms from chosen countries of Central and Eastern Europe and to find out the determinants of competitiveness correlated to the production potential of farms, management efficiency and an investment activity. It was discovered that the competitiveness level of agricultural farms in the chosen countries of Central and Eastern Europe was characterized by a considerable diversity. The highest level of competitiveness characterized agricultural farms from the Czech Republic, and the lowest was achieved by agricultural farms in Slovakia. When analyze the impact of selected factors characterizing the production potential, management efficiency and investment activity of agricultural farms on the level of competitiveness, their varied impact resulting from the specificity of agriculture in a given country was found. The attention was also paid to the need to look for determinants of the competitiveness of farms in their surroundings.

Key words: competitiveness, Competitiveness Index, efficiency, production potential, investments

INTRODUCTION

Competitiveness is a term used in relation to enterprises, sectors, regions, countries, as well as supranational organizations. In the realities of the contemporary global economy, competitiveness becomes one of the main factors in an appraisal of the functioning of an enterprise in the market and determines its development opportunities.

The competitiveness of an enterprise is treated as a multidimensional category, defined by a set of factors such as: market share, share in basic market segments, an impact on the market, scale of operations, technologies used, resources possessed, skills and adaptability. The competitiveness of an enterprise is a multidimensional feature resulting from its internal conditions, but it is also shaped to a large extent by a set of environmental factors [6].

Measuring the competitiveness of an agricultural farm is often simplified and boils down to determining its competitive position by comparing its economic results with other farms under certain economic conditions. Taking into account the chain of causality and positive feedback in the form of long-term ability to affect of the competitive rank on future competitive potential and development opportunities, such simplification is justified. In the work it has been assumed that the level of generated agricultural income determines the competitiveness of the farm. This narrowing of competitiveness is connected to the importance of agricultural income in shaping sustainable foundations for long-term growth and development. It is savings level that determines the agricultural income, which again largely determines the investments of farms. Subsequently, an increase in investment induces a rise in the value of tangible fixed assets, which in turn enhances

the production potential, volume of output, changes the relations of factors of production, and in particular improves the relation of capital to work, which induces increase in labour productivity, which is a condition for the increase of value agricultural income, which then it can transform into savings and successive investments outlays. Therefore, the amount of agricultural income generated not only ensures satisfaction with running a farm, but also guarantees the maintenance of competitiveness and is fundamental to the developmental capacity and growth, as well as the agriculture modernization.

MATERIALS AND METHODS

The purpose of the research was an evaluation of competitiveness of farms from chosen countries of Central and Eastern Europe (the Czech Republic, Slovakia, Hungary, Poland, Romania, Bulgaria) and the determination of competitiveness determinants related to the production potential of farms, management efficiency and an investment activity.

The object of the research was agricultural farms embraced by the FADN (*Farm Accountancy Data Network*) monitoring system. The analysis period covered the years 2011-2015.

In order to determine the competitiveness of farms, the competitiveness index (*CI*) was used following W. Kleinhans [1].

The following formula is applied to measure competitiveness:

$$CI = \frac{FNI_c}{OC_{fw} + OC_{ol} + OC_{oc}}$$

where:

- *CI* – Competitiveness Index of farms from a given country,
- *FNI_c* – average value of Farm Net Income (*FNI*) of farms from a given country (*c*),
- *OC* – opportunity costs for own factors of production held at a farms in a given country: *OC_{fw}* work of family members (*fw*), own agricultural land (*ol*) and own capital (*oc*).

The value of $CI \geq 1$ points to at least full coverage of the opportunity costs of factors of

production, while $CI < 1$ features their incomplete coverage.

The analysis adopts further classification of the Competitiveness Index (*CI*) value which differentiates the following classes:

- *CI* (-) value in case of negative *FNI* index (*CI*),
- $0 \leq CI < 1$ partial coverage (*CI*),
- $1 \leq CI < 2$ full coverage: 100% or more (*CI*),
- $CI \geq 2$ coverage of 200% and more % (*CI*).

The *FNI* index is taken directly from FADN data, while opportunity costs (*OC*) come from the costs of external factors and are aggregated by countries:

- *OC_{ol}* (opportunity costs of own land) based on the rent on leased land,
- *OC_{fw}* (opportunity costs of family labour) calculated based on the costs of work of paid employees,
- *OC_{oc}* (opportunity costs of own capital) based on the interest rates (apart from lands).

The study assumes that competitiveness is a capacity of a farm to growth and development. Such a farm's ability is achieved when its agricultural income (*FNI*) is twice as large as the costs of its own production factors. This approach differs from the traditional definition of competitiveness as achieving an advantage (cost, price, market share, etc.) in relation to competitors. The traditional approach to define competitiveness for farms may raise certain reservations, as agricultural farms do not compete in the global, European market. Other companies from other agribusiness chains (commercial and production companies) compete in these markets. For this reason, determining competitiveness as the ability to sustainably develop in a market economy seems reasonable [7].

RESULTS AND DISCUSSIONS

The data on the competitiveness of farms from selected Central and Eastern European countries is featured in Table 1. The data shows that the highest level of competitiveness (*CI*) was recorded in

agricultural farms in the Czech Republic, where competitiveness ratios in the analyzed period took values in the range $1 \leq CI < 2$ (CI). Also for Hungary the average value of the competitiveness index (CI) in period 2011-2015 was in the scope of $1 \leq CI < 2$ (table 1). However, for Hungary, the competitiveness index in 2012 and 2013 only allowed partial coverage of the opportunity cost of production factors ($0 \leq CI < 1$). Competitiveness Index (CI) for Bulgarian farms in the analyzed period assumed values close to 1, which also indicated a significant competitive potential. In turn, the competitiveness (Competitiveness Index – CI) of farms in Poland ($CI=0.69$) and Romania ($CI=0.65$) was at a similar level. The obtained farm net income (FNI) in these two countries allowed only the partial covering of the opportunity costs of own production factors (OC). The lowest level of competitiveness was characterized by agricultural management in Slovakia. In this case, agricultural income (FNI) allowed only partial coverage of own production costs (OC), while the Competitiveness Index (CI) in 2012 and 2013 assumed negative values.

Table 1. Competitiveness Index (CI)

Country	Year					Average
	2011	2012	2013	2014	2015	
Czech Republic	1.38	1.28	1.27	1.59	1.06	1.32
Slovakia	0.38	-0.19	-0.15	0.64	0.76	0.29
Hungary	1.59	0.31	0.35	1.56	1.23	1.01
Poland	0.83	0.81	0.70	0.57	0.52	0.69
Romania	0.67	0.68	0.70	0.67	0.51	0.65
Bulgaria	0.95	0.88	1.02	1.05	0.92	0.96

Source: Own calculation on the basis of data from FADN

The group of factors of an exogenous and endogenous nature decides about the level of competitiveness of farms. Among the exogenous factors, the most important factors will be economic ones (such as: an economic growth rate, an income level of the population, inflation, prices of the available factors of production and their relations, unemployment, economic situation, interest rates, tax rates, exchange rates, international trade, the situation of public finances, etc.) and institutional conditions (organizations, standards, regulations, agricultural policy). In turn, among endogenous factors, the attention

is paid to the volume of agriculture output generated by farm, the relations of production factors (techniques of production) and the economics effectiveness. In the paper the focus was paid to endogenous factors, being aware that a large part of endogenous factors depend on exogenous ones (e.g. the effectiveness of farming depends not only on the farmer's skills, but as well depends on the level of prices of food and agricultural products and goods purchased by farms; relations of production factors are not only conditioned by the method of organizing the farm, but they are primarily the resultant of the price relations of the available production factors).

A study of the farms production potential in selected countries indicates their considerable variation (Table 2). The farms from Slovakia and the Czech Republic were characterized by a particularly large production potential (expressed in the economic size, total utilized agricultural of area and total labour input). The differences between the analyzed countries were significant. In the analyzed period (2011-2015), the average utilised agricultural area in Slovakia was 52.28 ha U.A.A., in the Czech Republic it was 207.2 ha U.A.A. (Table 2). In other countries, the average utilised agricultural area was significantly smaller. In Hungary, 49.8 ha U.A.A., in Bulgaria 38.4 ha U.A.A., in Poland 18.6 ha U.A.A. and in Romania only 9.6 ha U.A.A. The effect of differences in the average utilised agricultural area were also significant distance between farms from analyzed countries in the production potential assessed by the economic size. The highest value of the economic size was noted for agricultural holdings in Slovakia and the Czech Republic, and the smallest values in Romania and Poland. In addition, there was a different level of use of external factors of production. The smallest percentage of rented U.A.A. occurred in Poland (26.5%), in other countries it ranged from 54.9% to 93.7%. The share of hired employees in labour resources was also the least important in Poland and Romania. The agricultural farms in Slovakia were characterized by a particularly high level of involvement of waged labour. Similarly,

the involvement of foreign capital in the financing of agricultural farms was the smallest in Poland and Romania. In addition to the production potential expressed in a quantitative and valuable sense, the mutual relations of production factors are very important, because they define the applied production technique, but also the value and structure of production costs and profitability of agriculture output [2, 3, 4]. For agriculture, two kinds of relationships are very significant: (i) labour and capital inputs in ratio to the utilised agricultural area; (ii) utilised agricultural area and capital in ratio to the labour. The first type of dependence is used to evaluation the so-called intensity of agricultural production or technical equipment of agricultural land. The second type of indicator is, in turn, the estimate of work equipment (employed in agriculture) in the ground (utilised agricultural area) and other means of production, especially technical ones (tangible fixed assets).

Table 2. Production potential of farms (average for 2011–2015)

Variables	Country					
	The Czech Republic	Slovakia	Hungary	Poland	Romania	Bulgaria
Economic size	245.4	432.8	54.0	27.1	9.6	31.3
Total Utilised Agricultural Area [ha]	207.2	527.8	49.8	18.6	9.4	38.4
Rented U.A.A. [%]	80.3	93.7	62.1	26.5	54.9	87.5
Total labour input [AWU]	5.8	13.1	1.6	1.7	1.2	2.4
Share of hired work in total work [%]	77.4	93.3	59.2	13.0	10.9	51.7
Number of employees AWU/100 ha U.A.A.	2.8	2.5	3.3	9.1	12.7	6.4
The value of fixed assets per one employee [thous. EURO/AWU]	93.4	44.7	68.8	84.8	23.1	25.8
The value of fixed assets per 1 ha of U.A.A. [thous. EURO]	2.6	1.1	2.2	7.7	2.9	1.7
Share of total debts in liabilities [%]	25.6	22.8	17.4	6.0	2.6	20.0

Source: Own calculation on the basis of data from FADN

The highest employment level per 100 ha U.A.A. farms in Romania, Poland and Bulgaria were characterized (Table 2). In turn, the highest value of fixed assets per one

employed person was found in agricultural holdings in the Czech Republic and Poland.

The lowest level of these ratios was recorded in Romania and Bulgaria. Similar diversification related to the level of fixed assets in thousand euro per 1 ha of U.A.A. The highest level of this ratio was recorded in Poland, while in other countries this ratio was much lower. This diversification of the farm equipment level in production factors and their mutual relations may also, as a consequence, determine the competitiveness level. In the further part of the analysis, the attention was paid to the effectiveness of farms in individual countries. The results of calculations are shown in Table 3. The efficiency of management and the level of cost-consuming production (Total specific costs/Total output and Total specific costs per 1 ha U.A.A) was diversified between the analyzed countries. It is worth taking notice the importance of the balance of subsidies and taxes for operating activities in shaping farm income. This was presented by the share of subsidies and taxes in Farm Net Value Added (Table 3).

Table 3. Economic efficiency of farms (average for 2011–2015)

Variables	Country					
	The Czech Republic	Slovakia	Hungary	Poland	Romania	Bulgaria
Profitability of production (Total output/Total input) [%]	0.89	0.80	1.04	1.17	1.44	0.99
Total specific costs per 1 ha U.A.A.	647.5	517.8	621.5	681.7	398.5	381.6
Total specific costs/Total output	0.44	0.48	0.43	0.43	0.32	0.37
Total output/AWU [thous. EURO]	52.2	43.3	44.1	17.4	9.9	16.4
Total output/1 ha U.A.A. [thous. EURO]	1.49	1.12	1.51	1.53	1.21	1.01
Total output/Total assets [EURO/100 EURO]	40.6	55.2	40.3	18.3	32.4	43.7
Family Farm Income/FWU	18.4	16.5	22.9	6.3	4.1	4.4
Farm Net Income /1 ha U.A.A	231.3	22.8	392.5	517.2	543.6	227.8
Farm Net Income /Net worth [%]	8.7	1.6	13.3	6.4	14.4	12.1
Share of balance current subsidies & taxes in Farm Net Value Added	66.5	86.2	49.2	45.9	23.4	43.1

Source: Own calculation on the basis of data from FADN

It is noticeable that agricultural support instruments applied under the common EU agricultural policy are of great importance in shaping agricultural income, especially in Slovakia and the Czech Republic.

Despite the fact that farms from these two countries present much greater production potential, their ability to create income without public aid is much smaller than in other countries. The smallest share of subsidies in the net value added farm took place in Romania. This institutional factor also seems to be an important element shaping the level of competitiveness of farms.

The analysis also drew attention to the investment activity of farms (Table 4). This activity, as well as the previously analyzed production potential and efficiency of management, varied. The smallest scale of completed investments was characterized by agricultural management in Romania, in particular a low investment level per one employee and per 1 ha of U.A.A. Important information about the development possibilities of a farm is also the renewal rate of fixed assets, computed as the ratio of gross investment outlay to the fixed assets [5].

Table 4. Investment activity of farms (average for 2011–2015)

Variables	Country					
	The Czech Republic	Slovakia	Hungary	Poland	Romania	Bulgaria
Gross Investment [EURO]	53,057.4	98,914.8	8,683.8	4,153.2	484.8	8,228.0
Net Investment [EURO]	18,010.4	9,951.2	2,477.0	-463.8	-741	3,200.4
Gross Investment/Total labour input [EURO/AWU]	9,096.2	7,547.4	5,349.3	2,454.7	406.5	3,390.2
Gross Investment /U.A.A. [EURO/ha]	256.5	186.8	174.6	223.2	51.9	214.0
Fixed assets renewal ratio [%]	9.9	17.5	7.8	2.9	1.7	13.9

Source: Own calculation on the basis of data from FADN

Same to the previously evaluated investment activity (investment level per one employee and per 1 ha of U.A.A), the value of this ratio in farms in Romania was definitely lower than in other countries. Differentiation of farmers' investment activity may in the future decide not only about the production capacity, but also the efficiency of management, the level of modernity of the production workshop, the quality of manufactured products, which in turn may lead to further diversification of competitiveness of agricultural in the analyzed countries and to deepen development differences.

In order to determine the relationship between the competitiveness ratios of farms, their production potential, economic efficiency and investment activity, a statistical analysis was made. As for the interdependencies between the competitiveness index (CI) and the production potential, it was found that the statistically significant production potential determined the competitiveness of agricultural farms in Poland.

Table 5. R – Spearman correlation coefficients between variables Competitiveness Index (CI) and variables characterizing production potential of farms

Variables	The Czech Republic	Slovakia	Hungary	Poland	Romania	Bulgaria
Economic size	-0.645	0.589	-0.230	-0.659	0.313	0.056
Total Utilised Agricultural Area	0.119	0.347	0.705	0.687*	0.429	0.586
Rented U.A.A.	0.297	-0.740	-0.286	0.944*	-0.727	-0.147
Total labour input	0.111	-0.150	0.757	0.978*	0.550	-0.309
Share of hired work in total work	0.059	0.838	-0.507	0.918*	0.530	0.477
Number of employees AWU/100 ha U.A.A.	-0.004	-0.625	0.609	0.895*	0.639	-0.555
The value of fixed assets per one employee	-0.175	0.837	-0.277	-0.99*	-0.771	-0.751
The value of fixed assets per 1 ha of U.A.A.	-0.157	0.862	-0.227	-0.988*	-0.729	-0.759
Share of total debts in liabilities	0.026	0.887*	0.536	0.857	-0.924*	0.790

* significant for $p < 0,05$

Source: Own calculation on the basis of data from FADN

Along with an increase in the production potential expressed in terms of total utilized

agricultural area (R - Spearman = 0.687), increased importance of land lease (R - Spearman = 0.944), a growth in labour resources (R - Spearman = 0.978) and the share of hired employees in labour inputs (R - Spearman = 0.918), the level of employees per 100 ha of U.A.A. (R - Spearman = 0.895) the competitiveness index was significantly higher (Table 5).

In turn, the increase in technical equipment of labor in agriculture (R - Spearman=-0.99) and technical equipment of agricultural land (R - Spearman = -0.988) was negatively correlated with the index of competitiveness of farms (CI) in Poland. For Romania and Slovakia, only the share of total liabilities in financing the assets of farms statistically significantly influenced on the farms competitiveness level. In Romania, this relationship was negative (R - Spearman = -0.924), while in Slovakia it was positive (R - Spearman = 0.887).

Table 6. R – Spearman correlation coefficients between variables Competitiveness Index (CI) and variables characterizing economic efficiency of farms

Variables	Country					
	The Czech Republic	Slovakia	Hungary	Poland	Romania	Bulgaria
Profitability of production	0.915*	0.927*	0.225	0.972*	0.980*	-0.505
Total specific costs per 1 ha U.A.A.	-0.297	0.871	0.136	-0.667	0.051	0.258
Total specific costs/Total output	-0.440	0.734	0.102	-0.943*	-0.428	0.523
Total output/AWU	0.135	0.872	0.028	0.099	-0.243	0.366
Total output/1 ha U.A.A.	0.246	0.929*	0.179	0.685	0.497	-0.632
Total output/Total assets	0.246	-0.560	0.570	0.995*	0.412	0.768
Family Farm Income/FWU	0.820	0.793	-0.083	0.995*	0.562*	0.222
Farm Net Income /1 ha U.A.A	0.932*	0.999*	0.327	0.992*	0.993*	-0.820
Farm Net Income /Net worth	0.675	0.997*	0.502	0.996*	0.960	0.684
Share of balance current subsidies & taxes in Farm Net Value Added	-0.751	-0.896*	-0.173	-0.851	0.628	0.481

* significant for $p < 0,05$

Source: Own calculation on the basis of data from FADN

For Bulgaria, Hungary and the Czech Republic, there were no statistically significant relationships between the production potential and the farms competitiveness level (Table 5).

A further analysis of the competitiveness (Competitiveness Index) determinants concerned its relation to the economic efficiency (Table 6). For Bulgaria, Hungary there were no statistically significant relationships between the economic efficiency and the competitiveness of farms. For the Czech Republic, the profitability (R - Spearman = 0.915) and profitability land ratio (R - Spearman = 0.932) positively influenced on the competitiveness ratios. Similarly, in the case of farms in Romania, the profitability of agricultural production (R - Spearman = 0.980), the profitability of land (R - Spearman = 0.993), and the level of family farm income/FWU (R - Spearman = 0.562) had a positive influence on the farms competitiveness (CI). For Poland and Slovakia, there was a greater number of determinants showing the competitiveness level of agricultural enterprises. For Poland, statistically significant positive dependences were found between the competitiveness index (CI) and profitability of agricultural production (Total output/Total input) (R - Spearman = 0.972), productivity of fixed assets (R - Spearman = 0.995), family work profitability (FWU - Family Work Unit) (R - Spearman = 0.995), profitability of land (R - Spearman = 0.992) and return on equity (Farm Net Income /Net worth) (R - Spearman = 0.996). A significantly negative statistical dependence in Poland was noted for the relationship between competitiveness (CI) and cost-efficiency of production (Total specific costs/Total output) (R - Spearman = -0.943). In turn, in Slovakia, the farms competitiveness was shaped by a different set of factors. The statistically significant positive influence on the level of competitiveness was the profitability of agricultural production (R - Spearman = 0.915), land productivity (R - Spearman = 0.929) and land profitability (R - Spearman = 0.999). For Slovakia, the share of the balance of subsidies and taxes in the net value added farm (R - Spearman = -0.896) in

shaping the competitiveness index was negative. There was no statistically significant impact of investment activity on the competitiveness index of farms (*CI*) in the analyzed countries.

In the case of interdependencies between the competitiveness index (*CI*) and investment activity, it was not found that the statistically significant correlation (Table 7).

The analysis carried out shows a varied degree of impact of endogenous factors on the competitiveness index (*CI*) of farms. This diversification may result from regional disproportions in the level of agricultural development between the analyzed countries, as well as result from differences in the institutional environment of agriculture and the economic situation concerning the economies of individual countries.

Table 7. R – Spearman correlation coefficients between variables Competitiveness Index (*CI*) and variables characterizing investment activity of farms

Variables	Country					
	The Czech Republic	Slovakia	Hungary	Poland	Romania	Bulgaria
Gross Investment	0.242	0.530	0.435	0.464	-0.345	0.410
Net Investment	0.398	0.178	0.383	0.719	-0.187	0.029
Gross Investment/Total labour input	0.168	0.635	0.271	0.380	-0.456	0.398
Gross Investment /U.A.A.	0.136	0.510	0.293	0.442	-0.389	0.050
Fixed assets renewal ratio	0.329	-0.486	0.444	0.669	-0.312	0.645

* significant for $p < 0,05$

Source: Own calculation on the basis of data from FADN

CONCLUSIONS

The competitiveness level (*CI* - Competitiveness Index) of agricultural holdings in the examined countries of Central and Eastern Europe was characterized by a considerable diversity. The highest level of competitiveness was characteristic for agricultural farms from the Czech Republic (where competitiveness ratios in the analyzed period took values in the range $1 \leq CI < 2$). In turn, the lowest competitiveness level was observed in agricultural farms in Slovakia (where average Competitiveness Index took values in the range $0 \leq CI < 1$). In these two

countries agricultural farms were characterized by a much larger production potential than in other countries. Despite this, the agricultural management in Slovakia could not achieve high competitiveness ratios. It may be related to the existence of the optimal size of a farm. The desire to increase the scale of production has its limits resulting from the limitations of management.

While analyzing the impact of selected factors characterizing the production potential, management efficiency and investment outlay of farms on the level of competitiveness, their varied impact resulting from the specificity of agriculture in a given country was found. In Bulgaria and Hungary, there was no statistically significant influence of selected factors that characterize agricultural farms on their competitiveness level (Competitiveness Index). The highest number of endogenous factors connected with production potential and farms organization that determined the competitiveness level was recorded in Poland. The diversity and the lack of statistically significant impact of the analyzed determinants on the competitiveness (*CI* - Competitiveness Index) of the surveyed farms indicate the need to identify them in the surroundings of farms, but also the necessity to pay attention to aspects related to the farms organization.

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