

COMPETITIVENESS OF POLISH FARMS OF DIFFERENT AREA SIZES HIGHLY SPECIALISED IN THE CULTIVATION OF CEREALS, OILSEEDS, AND PROTEIN CROPS

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ABSTRACT

Background. Efficiency and competitiveness of Polish farms of various area sizes highly specialised in growing cereals, oilseeds, and protein crops were analysed. Their potential, intensity, and production costs were also assessed.

Material and methods. Research was carried out in the years 2015–2019. Information was used from farms keeping Polish FADN accounts contained in publications: "Technical and economic parameters by groups of farms participating in the Polish FADN" in the years 2015–2019. The following two methods were used: descriptive with the use of tabular statements and comparative.

Results. In the years 2015–2019, production potential, efficiency, and competitiveness of Polish farms highly specialised in the cultivation of cereals, oilseeds, and protein crops depended on their area size.

Conclusion. In the analysed period, only the largest farms, above 50 ha, turned out to be able to compete. In the other area groups of farms, competitiveness index lower than one indicated their lack of competitive ability.

Key words: competitiveness, efficiency, production costs, production intensity, production potential

INTRODUCTION

In Polish agriculture, the processes of farm concentration and specialisation are progressing. The number of agricultural farms is systematically decreasing with a simultaneous increase in their average area. In the years 2010–2020, the number of farms in total decreased from 1 509 000 to 1 317 000, while the average area of an agricultural farm increased from 11.3 ha to 12.4 ha and utilised agricultural area (UAA) from 9.8 ha to 11.1 ha. There has been an increase in the average area of farms focused on plant production, while those focused on animal production have decreased. Farmers increase

the area of farms and the scale of production in order to obtain an adequate level of income. PSR 2020¹ showed an increase in the proportion of larger area commercial farms (over 15 ha of arable land) with a large production scale and the smallest farms (up to 1 ha of arable land), which mostly conduct very intensive production (greenhouses and animal farms). Thus, the importance of market-oriented farms is increasing. In the last decade, there has been an increase in the percentage of farms focused exclusively on plant production (from 38.9% in 2010 to 55.8% in 2020). In 2020, the average UAA of farms involved only in plant production was 9.6 ha. Cereals

¹ PSR 2020 – Agricultural Census 2020.

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dominated in their sowing structure (68.9%), industrial crops constituted 15%, whereas protein crops 4%. The highest proportion of cereals, amounting to almost 80%, was found in farms with the area of up to 10 ha, and the lowest in farms with the area of 50 ha and more, which, in turn, were characterised by the highest proportion of industrial plants (19.6%) and high-protein plants (3.8%) (CSO, 2021).

Functioning of agricultural farms is determined by the economic profitability of their production or their competitive ability. Competitiveness depends on the potential of a given farm, including the amount of land, property, and financial resources, and the quality of the human factor. It enables the farm to be sustainable in the long term. In addition to its current functioning, it also ensures its ability to develop (Józwiak (ed.), 2014; Natchman, 2015). It requires earning an income in the farm that will allow covering the costs of using own production factors (land, labour, and capital) and financing net investments. This is because an income higher than the cost of using own factors of production conditions competing and staying in the market. If it is lower, the farm may try to adapt to farming conditions or use its resources differently (Kleinhans, 2015).

It was assumed that the competitiveness of farms highly specialised in the cultivation of cereals, oilseeds, and protein crops (COP²) was determined, among others, by the size of UAA. Therefore, the aim of the research was to assess the efficiency and competitiveness of Polish farms highly specialised in the cultivation of cereals, oilseeds, and protein crops of different area sizes in the years 2015–2019.

MATERIAL AND METHODS

The research covered farms highly specialised in the cultivation of cereals, oilseeds, and protein plants, which kept Polish FADN accounts. The condition for qualifying a farm to the group was the proportion of the sales value of a given product in the total sales value amounting to at least 80% in the case of cereal, oilseed, and protein plants. The information was used

from the publications "Technical and economic parameters by groups of farms participating in the Polish FADN". Arithmetic averages of the studied characteristics from the years 2015–2019 were used. The analysis included farms grouped by area size in ha: 5–10, 10–20, 20–30, 30–50, and over 50³. Potential of the farms was measured by: the size of UAA (ha), total labour input per 100 ha of UAA (AWU⁴), the proportion of own work in the total work effort (%), total assets (thousand PLN), capital of the farm (thousand PLN per ha UAA), and the indicator of technical equipment at work measured by the value of machines and devices in thousand PLN per 1 person fully employed (AWU). Also production costs measured by total costs per 1 ha of arable land (PLN) and costs incurred for making 1000 PLN of production (PLN) were analysed. Production efficiency of farms was characterised with the use of the productivity indices of land, labour, and total assets⁵. Competitiveness of the farms was assessed with the use of the competitiveness index (CI). Value of $CI \geq 1$ indicates full coverage by income of the costs of own production factors, while $CI < 1$ indicates their incomplete coverage.

$CI = \text{farm income} / (\text{opportunity cost of own land} + \text{opportunity cost of own labour} + \text{opportunity cost of own capital (without own land)})$

More detailed classification of the competitiveness index was adapted after Kleinhans (2015), where:

CI1 – indicates negative farm income,

CI2 ($0 < CI < 1$) – partial coverage of the costs of own production factors,

CI3 ($1 < CI < 2$) – full coverage of the costs of own production factors,

CI4 ($CI \geq 2$) – double and higher coverage of the costs of own production factors.

If the value of CI falls within the range of $1 < CI < 2$, farms are able to compete, while the value of $CI \geq 2$ means that farms are fully competitive.

² COP – marking of the group of farms that specialise in cereals, oilseeds, and protein crops.

³ Grouping of farms according to the size of UAA in ha: 5–10 – small, 10–20 – medium-small, 20–30 – medium-large, 30–50 – large, over 50 – very large.

⁴ AWU – Annual Work Unit.

⁵ All figures shown in value terms are expressed in nominal prices.

Competitiveness of the studied farms was also analysed as their ability to develop as determined by income from management, income parity, and net investment rate. The following two methods were applied: descriptive with the use of tabular statements and comparative.

RESULTS AND DISCUSSION

Production potential of farms highly specialised in the cultivation of cereals, oilseeds, and protein crops, which were in the field of observation of the Polish FADN, depended on their area size. In the years 2015–2019, the UAA of the average farm from the area size groups: 5–10, 10–20, 20–30, 30–50, and over 50 ha reached respectively: 8.6; 15.2; 24.7; 39.5, and 112.2 ha. The largest farms (over 50 ha of UAA), which

based their activities to the greatest extent on hired labour, incurred the lowest labour input per 100 ha of UAA. Farms in the other area groups mostly used their own labour force. Decreasing labour input with increasing farm area was compensated for by increasing labour equipment, measured by the technical labour equipment index. Along with an increase in the area of the farm, the value of assets increased, while the capital of a holding per 1 ha of UAA decreased. The capital of an agricultural farm included the value of: animals, permanent crops, melioration facilities, buildings, machinery and equipment, and working capital. It did not include quotas and other rights that cannot be separated from the value of land (Bocian *et al.*, 2017) (Table 1).

Table 1. Production potential of farms highly specialised in the cultivation of cereals, oilseeds, and protein crops of different area sizes in the years 2015–2019

Specification	Farms by area size in ha:				
	5–10	10–20	20–30	30–50	over 50
UAA [ha]	8.6	15.2	24.7	39.5	112.2
Total labour input per 100 ha of UAA [AWU]	11.6	7.4	5	3.5	1.6
Proportion of own work in the total work effort [%]	98.8	99.1	99.0	98.1	86.1
Total assets [thousand PLN]	383.4	498.8	723.9	1050.1	2531.8
Farm capital per 1 ha of UAA [thousand PLN]	21.0	14.5	13.0	11.9	10.1
Value of machinery and equipment per 1 AWU [thousand PLN]	43.4	63.9	105.0	157.5	324.0

Source: own elaboration based on Bocian *et al.* 2017; 2018; 2019; 2020; 2021

Agricultural farms of the smallest areas produced the most intensively. Production intensity measured by the total costs per 1 ha of UAA amounted to 3887 PLN in an average farm from the group of 5–10 ha. It was similar in the farms of 10–20 ha and 20–30 ha (3272 PLN and 3232 PLN, respectively) and 30–50 ha and over 50 ha (3300 PLN and 3335 PLN, respectively). The costs incurred for the production of the value of

1000 PLN decreased with the increase in the area size of agricultural farms. The most expensive production occurred in the smallest farms of 5–10 ha and 10–20 ha. They incurred costs which exceeded the value of production (1085 PLN and 1025 PLN, respectively). The cheapest production occurred in the largest farms (886 PLN). Farms differed in the productivity of land, labour, and capital. The highest productivity of land

amounting to 3766 PLN per ha of arable land was characteristic for the largest farms, slightly lower for the farms of 5–10 ha and 30–50 ha (3596 and 3526, respectively), and the lowest (3195 PLN) for the farms of 10–20 ha. Another relation concerned labour productivity, which increased with the increase in the area of farms. In the largest farms (over 50 ha), the

production per one person fully employed was over 7.5 times greater than in the smallest farms (5–10 ha). Similar relation concerned the productivity of assets. From 1000 PLN invested in assets, the largest farms (over 50 ha) obtained 133.2 PLN of production, which was nearly two times more than the smallest farms (5–10 ha), for which it amounted to 67.2 PLN (Table 2).

Table 2. Production intensity, production costs, and efficiency of farms highly specialised in growing cereals, oilseeds, and protein crops of different area sizes in the years 2015–2019

Specification	Farms by area size in ha:				
	5–10	10–20	20–30	30–50	over 50
Total costs per 1 ha of UAA [PLN]	3887	3272	3232	3300	3335
Total costs per 1000 PLN of production [PLN]	1085	1025	974	936	886
Total production per 1 ha of UAA [PLN]	3596	3195	3322	3526	3766
Total production per 1 full-time employee [thousand PLN]	31.03	42.99	66.33	101.40	234.0
Total production per 1000 PLN of assets [PLN]	67.2	79.2	92.5	107.1	133.2
Total costs per 1 ha of UAA [PLN]	3887	3272	3232	3300	3335

Source: own elaboration based on Bocian *et al.*, 2017; 2018; 2019; 2020; 2021

Among the analysed farms, in the years 2015–2019, only the largest farms, above 50 ha (competitiveness index 1.9), demonstrated to be able to compete. In the other area groups of farms, competitiveness index lower than one indicated a lack of competitive ability. Therefore, they cannot be considered as development farms in the 2015–2019 five-year period. "The competitiveness of farms can be understood as their ability to develop under specific economic conditions, measuring it by such indicators as management income, income parity, and net investment rate" (Mirkowska and Ziętara, 2015, p. 51; Ziętara 2014, Sobierajewska and Ziętara, 2017). Only farms capable of competition highly specialised in growing cereals, oilseeds, and protein crops obtained positive management income, while in non-competitive farms it was negative. Therefore, the latter were not able to fully cover the costs of using their own production factors. Such farms according to Kleinhanss (2015) cannot sustain themselves in the long term.

Development of farms depends, to a large extent, on the amount of expenditures they make on the restoration, enlargement, and modernization of fixed assets (Józwiak, 2012; Czubałak and Sadowski, 2014; Grzelak, 2015; Sass, 2017). Farms able to compete were characterized by a positive net investment rate, whereas among non-competitive farms, only the farms of 20–50 ha did.

Competitive ability of farms determined the level of own labour remuneration. In the farms capable of competition, the own labour payment was 3.4 times higher than the average remuneration in the national economy, and among the farms without competitive ability, it was slightly higher only in the 30–50 ha farms (1.3 times). Farms up to 30 ha did not even reach the parity payment of own labour. According to Sobierajewska and Ziętara (2017), earning income from a farm at the parity level does not determine its competitive capacity. It is the competitiveness index that properly determines the competitive capacity of farms (Table 3).

Table 3. Competitiveness of farms highly specialised in growing cereals, oilseeds, and protein crops of different area sizes in the years 2015–2019

Specification	Farms by area size in ha:				
	5–10	10–20	20–30	30–50	over 50
Competitiveness index	0.2	0.4	0.7	0.9	1.9
Competitive capacity	lack of competitive capacity				able to compete
Management and risk income in thousand PLN*	-33.0	-29.5	-19.2	-3.6	90.0
Income parity**	0.2	0.5	0.8	1.3	3.4
Net investment rate in %***	-71.1	-30.6	4.4	17.7	26.0

* management income is the difference between farm income and the cost of using own factors of production (labour, land, and capital)

** income parity is the ratio of farm income per unit of own labour (FWU – *Family Work Unit* = 2120 hours of own work per year) to the average salary in the national economy. Average net salary in the national economy, based on the calculations of the Agricultural Accounting Department of IERiGŻ-PIB in the years 2015–2019 was, respectively: 31960 PLN, 33135 PLN, 34743 PLN, 37156 PLN, and 39877 PLN

*** net investment rate – the ratio of net investment to depreciation expressed in %

Source: own elaboration based on Bocian *et al.*, 2017; 2018; 2019; 2020; 2021

In all the analysed years, farms in the area groups of 5–10 ha, 10–20 ha, and 20–30 ha proved incapable of competition. The situation was different for farms larger in size. Large farms, with the area of 30–50 ha, where the competitiveness index in the years 2015–2019 was close to one (0.9) and very large farms, with the area of more than 50 ha, where it was close to 2 (1.9) were analysed in detail. The analysis demonstrated that their competitive ability varied in the analysed years. Large farms were able to compete in the years 2016–2017 (in the other years they had no competitive ability), while very large farms were competitive in the years 2015–2017 (in 2018–2019 they only demonstrated to be able to compete) (Tables 4 and 5). This was influenced by the level of income they earned, the estimated payment of their own labour, and the payment for their own land. Family

farm income in farms specialising in growing cereals, oilseeds, and protein crops decreased in 2015–2019, both in large (Table 4) and very large farms (Table 5). However, systematically, the cost of own labour increased in both groups of farms⁶. During the analysed period, the payment for own land also increased⁷. Growing disparity between the level of income received, the payment of own labour, and the payment of own land meant that large area farms, able to compete in the years 2016–2017, were uncompetitive in 2018–2019, while very large farms, competitive in the years 2015–2017, were only able to compete in 2018–2019 (Tables 4 and 5).

⁶ The estimated charge of own labour was adopted on the basis of the calculations of the Agricultural Accounting Department of IERiGŻ-PIB in the years 2015–2019. The cost of own labour is determined by the product of own labour expenditures incurred solely for the operational activity of the agricultural farm, represented by the number of full-time employees, and the average net remuneration in the enterprise

sector, without profit payments, based on the data of the Central Statistical Office (GUS) (Bocian *et al.*, 2017).

⁷ The estimated payment for own land is based on the calculations of the Agricultural Accounting Department of IERiGŻ-PIB in the years 2015–2019. It is determined on the basis of the amount of own land and the averaged rent calculated on the basis of FADN data from a given accounting year (Bocian *et al.*, 2017).

Table 4. Competitiveness of large farms highly specialised in growing cereals, oilseeds, and protein crops in the years 2015–2019

Specification	Large farms in the years:				
	2015	2016	2017	2018	2019
Competitiveness index	0.9	1.1	1	0.9	0.8
Competitive capacity	lack of competitive ability	capable of competing		lack of competitive ability	
Management and risk income in thousand PLN	-4.17	4.56	0.43	-5.71	-13.03
Income parity	1.31	1.44	1.36	1.21	1.08
Income from family agricultural farm in thousand PLN	59.56	64.68	62.88	59.72	56.23
Estimated payment for own work in thousand PLN	45.28	44.96	46.37	49.12	52.42
Estimated payment for own land in thousand PLN	11.23	11.65	12.56	12.71	13.38
Estimated payment for equity in thousand PLN ⁸	7.21	3.52	3.52	3.60	3.45

Source: own elaboration based on Bocian *et al.*, 2017; 2018; 2019; 2020; 2021

Table 5. Competitiveness of very large farms highly specialised in growing cereals, oilseeds, and protein crops in the years 2015–2019

Specification	Very large farms in the years:				
	2015	2016	2017	2018	2019
Competitiveness index	2.1	2.1	2	1.9	1.7
Competitive capacity		competitive		capable of competing	
Management and risk income in thousand PLN	100.78	100.25	96.83	86.88	65.24
Income parity	3.77	3.64	3.54	3.22	2.77
Income from family agricultural farm in thousand PLN	195.43	190.57	190.46	184.2	164.74
Estimated payment for own work in thousand PLN	51.70	52.45	53.88	57.2	59.55
Estimated payment for own land in thousand PLN	28.81	30.37	32.73	32.97	33.32
Estimated payment for equity in thousand PLN*	14.14	7.50	7.02	7.15	6.64

* the estimated equity payment was based on the calculations of the Agricultural Accounting Department of IERiGŻ-PIB for the years 2015–2019

Source: own elaboration based on Bocian *et al.*, 2017; 2018; 2019; 2020; 2021

⁸ The estimated equity payment was based on the calculations by the Agricultural Accounting Department of IERiGŻ-PIB in the years 2015–2019. The estimated equity payment is determined on the basis of the value of equity less the value of land owned by the farm and the average interest rate for PLN contracts including capital gains tax (Bocian *et al.*, 2017).

CONCLUSIONS

In the years 2015–2019, production potential, efficiency, and competitiveness of Polish farms highly specialised in growing cereals, oilseeds, and protein crops depended mainly on their area size. The conducted research allows to formulate the following conclusions:

1. The value of assets per farm increased as the area size increased. Very large farms used hired labour to the greatest extent, other farms used their own labour force. Decreasing labour input with the increase in the area of farms was compensated for by the increase in expenditure on the purchase of machinery and equipment. There was a substitution of live labour by technical means of labour.
2. The smallest farms produced the most intensively, and the least intensively – the farms of 20–30 ha and 10–20 ha. Costs exceeding the production value were recorded in the smallest agricultural farms with the area of 5–20 ha. The cheapest production was recorded in the largest farms, with the area of over 50 ha.
3. With the increase in the area size, labour productivity increased. Similar relation was observed with the productivity of assets. The highest land productivity was characteristic for the largest farms, the lowest for the 10–30 ha farms.
4. In the analysed period, only the largest farms, above 50 ha, proved capable of competition. In the other area groups of farms, competitiveness index lower than one indicated a lack of competitive ability. Farms with the area of 30–50 ha could also be considered capable of competition. Their competitiveness was confirmed by the income parity above one and a positive net investment rate.
5. Competitive farms highly specialised in growing cereals, oilseeds, and protein crops obtained positive management income, whereas it was negative in non-competitive farms.
6. In farms capable of competition, own labour payment was 3.4 times higher than the average remuneration in the national economy. Among farms without competitive ability, it was slightly higher only in the farms of 30–50 ha. Farms in the other area groups did not even reach the parity payment for own labour.

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KONKURENCYJNOŚĆ POLSKICH GOSPODARSTW WYSOKO WYSPECJALIZOWANYCH W UPRAWIE ZBÓŻ, ROŚLIN OLEISTYCH I BIAŁKOWYCH O RÓŻNEJ WIELKOŚCI OBSZAROWEJ

Streszczenie

Analizowano efektywność oraz konkurencyjność polskich gospodarstw wysoko wyspecjalizowanych w uprawie zbóż, roślin oleistych i białkowych o różnej wielkości obszarowej. Ocenie poddano także ich potencjał, intensywność i koszty produkcji. Badaniem objęto lata 2015–2019. Wykorzystano informacje z gospodarstw prowadzących rachunkowość polski FADN zawarte w publikacjach: „Parametry techniczno-ekonomiczne według grup gospodarstw rolnych uczestniczących w Polskim FADN” w latach 2015–2019. Zastosowano metody: opisową z wykorzystaniem zestawień tabelarycznych oraz porównawczą. W latach 2015–2019 potencjał produkcyjny, efektywność i konkurencyjność polskich gospodarstw wysoko wyspecjalizowanych w uprawie zbóż, roślin oleistych i białkowych uzależnione były od ich wielkości obszarowej. W analizowanym okresie zdolnymi do konkurencji okazały się jedynie największe obszarowo gospodarstwa, powyżej 50 ha, w pozostałych grupach obszarowych gospodarstw mniejszy od jedności wskaźnik konkurencyjności wskazuje na brak przez nie zdolności konkurencyjnej.

Słowa kluczowe: efektywność, intensywność produkcji, konkurencyjność, koszty produkcji, potencjał produkcyjny