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Competitiveness of Polish dairy farms in the European Union

Andrzej Parzonko[1]*, *Piotr Bórawski*[2]

[1]*Department of Economics and Organization of Enterprises,Faculty of Economic Sciences, Warsaw University of Life Science-SGGW, Warsaw, Poland*
[2]*Department of Agrotechnology, Agricultural Production Management and Agribusiness, Faculty of Environmental Management and Agriculture, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland*

**Corresponding author: andrzej_parzonko@sggw.pl*

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Abstract: This article analyses the competitiveness of dairy farms in Poland in relation to selected EU countries. The competitive advantage of dairy farms was evaluated and compared based on remuneration for family labour. Two variants of the above indicator were calculated: (1) Remuneration for family labour (FL_1) as the relationship between farm net income and the farmer's unpaid labour input, and (2) Remuneration for family labour (FL_2) as the relationship between farm net income minus the opportunity costs of own land and capital to the farmer's unpaid labour input. The calculations were performed based on EU FADN (European Union Farm Accountancy Data Network) data for an average dairy farm in 2005, 2010 and 2016. The study revealed the highest average remuneration for family labour (FL_1) in Irish and German dairy farms. The value of the second indicator (FL_2) was also highest in Germany, followed by France. The analysis produced interesting results regarding dairy farms in Denmark and the Netherlands which were characterised by the highest scale of production in the evaluated period (high net value added), but very low farm incomes and remuneration for family labour. The study revealed that Polish dairy farms were characterised by average competitiveness relative.

Keywords: economic efficiency; labour profitability; milk production

Poland is one of the largest milk producers in the EU. In 2017, Poland produced 13.7 million tons of milk, representing 8.4% of EU production. The value of Poland's dairy exports reached EUR 2 240.6 million, i.e. 4.62 million tons in milk equivalents (33.6% of milk deliveries). The value of Poland's dairy exports rose by EUR 1 341.0 million between 2005 and 2018 (Milk Market – Status and Prospects 2007; 2019). These data indicate that Poland plays a significant role on the EU dairy market and continues to increase its output of dairy products that are traded in the international arena. Dairy farms are an important link in the production and distribution chain. They influence milk supply on the market and, to a certain extent, the behaviour of processing companies and distributors. The factors that determine the growth of EU dairy farms should be analysed due to their impact on the future of the milk market. These factors are not easy to identify because the EU-28 countries differ considerably in terms of: (1) historical experiences and cultural patterns, (2) economic growth (including agriculture), (3) environmental conditions and climate. The following detailed questions should also be answered: (1) How competitive are cattle breeders and dairy producers relative to other types of agricultural activity in the EU Member States? (2) How competitive are dairy farms in the EU countries, including in Poland? This article attempts to answer the second question.

Common Agricultural Policy (CAP) has undergone major reforms. In 1992 the MacSharry reform introduced the reduction of butter and dairy products inter-

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vention prices by 9% and 7.5% respectively (Folmer et al. 1995; Zhu et al. 2008). In 2013, the CAP was reformed again with the aim of liberalising the milk market, affecting the EU's position of a significant milk producer in the world. In 2015, milk quotas were phased out, and the restrictions on the import of milk products from outside the EU were relaxed. These measures increased the competitiveness of the EU's dairy market, which influenced the behaviour of dairy farms. For example, dairy farms in the Netherlands have been seeking to increase the intensity and scale of milk production (Groeneveld et al. 2016). The purchase prices for raw milk were equalised and began to follow the prices quoted in New Zealand and in the USA (Szajner 2017). The "milk package" introduced by the EU to stabilise the dairy market (Regulation EU No. 261/2012) was not highly effective. In Poland, since 2015, direct payments for owned cows have been introduced to encourage farmers to produce milk. They proved to be quite ineffective (Parzonko 2017). New solutions, probably different from the existing ones, are expected in the next CAP programming period (2021–2027) (Wąs et al. 2018). An analysis of the proposals for the 2021–2027 financial framework leads to the following conclusions: (1) effective mechanisms for stabilizing the Member States' agricultural markets, including dairy markets, have not been proposed; (2) considerable emphasis has been placed on environmental and climate protection, which can slow down the process of production intensification and inhibit competition within the EU; (3) the Member States will be able to exert greater influence on the content of upcoming Commission proposals regarding the future of the CAP.

FARM COMPETITIVENESS IN ECONOMIC THEORY AND THE UNDERLYING FACTORS

Competition has existed since the dawn of human civilisation, and it is fueled by the struggle for limited resources, the desire to own resources, and personality traits (Bowler 1976). In a market economy, competition is rife, and it can be analysed in various dimensions (time, markets, businesses). Competition (competitiveness) between enterprises (agricultural farms) has different definitions in literature. One of the definitions describes competitiveness as a long-term ability of the company to make a profit (Turner and Golub 1997; Michaličková et al 2014). A broad approach to this problem has been proposed by Gorynia (2004) who defined competition as the ability to act and survive in a competitive environment. In this context, the main emphasis is placed on the long-term operations of businesses in a market economy. Most authors are in agreement that competitiveness is a relative concept which can be analysed in a comparative approach (Siudek and Zawojska 2014). Therefore, the concept of competitiveness should be decomposed and operationalised. The following dimensions of competitiveness are generally recognised: (1) the competitive potential of an enterprise, (2) the strategy of market competitors, (3) competitive advantage. This study evaluates the competitiveness of dairy farms in Poland relative to selected EU countries.

The competitiveness of Polish agricultural holdings, including cattle and dairy farms, has been broadly analysed in the domestic literature (Sass 2017; Wilczyński and Kołoszycz 2017; Bórawski et al. 2018; Parzonko 2018; Ziętara and Adamski 2018; Kołoszycz and Świtłyk 2019). The relevant studies differ mainly in the analysed period, sources of data, and the applied methodology. The competitiveness of dairy farms in the international arena is usually investigated based on three sources of data: European Dairy Farmers (EDF), International Farm Comparison Network (IFCN) and the European Union Farm Accountancy Data Network (EU FADN). Most of the research conducted by Kołoszycz and Świtłyk (2019) and Wilczyński and Kołoszycz (2017) relies on EDF and IFCN data, and milk production costs (usually per 100 kg of standardised milk) are the main parameter for evaluating the competitive advantage of dairy farms. This approach is also used by the researchers to coordinate the operations of International Farm Comparison Network (IFCN) and European Dairy Farmers (EDF) (Iserrmeyer et al. 2003). In one of their most recent studies, Kołoszycz and Świtłyk (2019) relied on EDF data to report that total production costs in 2016 were lowest in large-scale dairy farms with a high milk output. In the group of the compared EU countries, total production costs were lowest in Polish and Irish dairy farms. It should be noted that the average herd size in Polish dairy farms specialising in milk production (included in the analysis) was 30 cows, which is well above the average in the Polish agricultural sector. Ziętara and Adamski (2018) relied on empirical EU FADN data to compare the competitive advantage of dairy farms in 8 EU countries (Poland, Hungary, Lithuania, Austria, Germany, Denmark, Netherlands and France) in 2013–2015. They found that medium-sized and large Polish farms with a standard output of EUR 50 000–100 000 and EUR 100 000–500 000, land holdings of 39.1 ha and 81.3 ha, and 31 and 65 cows,

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respectively, were characterised by the highest competitive advantage on the EU market (Ziętara and Adamski 2018). In the above study, competitiveness was evaluated based on the rate of income from an agricultural holding to the opportunity costs of own factors of production (Kleinhanss Competitiveness Index). A study evaluating dairy farms in the EU based on EU FADN data demonstrated that in 2009–2015, the average production costs per 100 kg of milk were lowest in Poland, Lithuania and Latvia, and were highest in Denmark and the Czech Republic (Parzonko 2018).

An analysis of the competitiveness of dairy farms should also involve a search for the factors that determine the competitive advantage of agricultural holdings. The underlying factors can be internal (productive potential and the ability to harness that potential) and external (outside the farmer's direct influence). According to Bórawski et al. (2018), the scale of production continues to be the main determinant of agricultural competitiveness. Large-scale production is generally associated with more efficient use of agricultural resources. The Standard Results of agricultural holdings based on Polish FADN data also indicate that the scale of production in dairy farms (production type: "dairy cows") strongly determines financial performance. In 2016, the income of dairy farms with standard output of EUR 100 000–500 000 was more than 11 higher than in farms with standard output of EUR 8 000–25 000 (EU FADN Poland 2017). The following factors significantly influence farm competitiveness measured by profitability: performance of dairy cows, chemical composition of milk (fat, protein, etc.), and milk quality (somatic cell count). Large dairy farms have greater competitive advantage because they can increase production and reduce specific costs, in particular fixed costs (Bailey et al. 1997; Krapalkova et al. 2016).

RESEARCH OBJECTIVE AND METHODS

The main aim of this study was to evaluate the competitiveness of dairy farms in Poland relative to selected EU countries in 2005, 2010, and 2016.

Dairy farms participating in the EU FADN system in the examined period were selected to achieve the set goal. The advantage of the data collected in the EU FADN system is their wide scope (they cover all EU countries) and a uniform methodology for obtaining them. This allows for proper comparisons between farms from individual EU countries. EU countries with large share in total EU milk production and increasing in 2005–2015 were selected for comparison. They were: Germany, France, Poland, the Netherlands, Denmark and Ireland (Parzonko 2018). In the years 2005–2015, the number of dairy farms covered by the EU FADN observation in the compared countries was: Germany – from 2 000 to 3 000, France – from 1 000 to 2 000, Poland – from 2 000 to 3 000, the Netherlands – from 200 to 500, Denmark – from 200 to 500, Ireland – from 200 to 500 (EU FADN 2019).

In agricultural economics literature, competitiveness of agricultural holdings is evaluated using various indicators. Measures and indicators of the farm's productive potential (value of assets, including fixed assets, buildings, land and human resources) and financial performance (net value added, farm receipts, and management income) are often deployed for this purpose. In studies investigating the competitiveness of agricultural holdings, Ziętara and Adamski (2018) relied on the rate of income from an agricultural holding to the opportunity costs of own factors of production. This indicator was proposed by Werner Kleinhanss in an article entitled "Competitiveness of the major types of Agricultural holdings in Germany" (Kleinhanss 2015), based on the work of Gallardo et al. (2002). Sass (2017) used the following indicators to analyse the competitiveness of agricultural holdings: management income, purchasing power parity, fixed asset turnover ratio, and net investments.

The present study was conducted on the assumption that labour productivity is the key determinant of competitiveness in a market economy (including on markets that are subjected to certain regulatory mechanisms, such as the CAP). This approach is consistent with the assumptions made by both the pioneers of modern economics such as Smith (2008), and contemporary researchers. According to Krugman (1990), "productivity is not everything, but in the long run, it is almost everything". Based on these observations, this article aims to determine the remuneration for family labour in average dairy farms in the leading milk producing countries in the EU. Indicators for assessing the economic efficiency of agricultural holdings (net value added and farm receipts) were also presented.

RESULTS AND DISCUSSION

The following measures and indicators were used to assess the competitive position of Polish dairy farms against the background of dairy farms from selected EU countries:

(1) Average net value added (FNVA) in the group of dairy farms from selected countries. This measure shows the amount of remuneration to the fixed factors

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Table 1. Average prices of production factors (land, labour and capital) in dairy farms in selected EU countries in 2005, 2010 and 2016

Specification	Year	Selected EU countries					
		DE	PL	NL	FR	IE	DK
Rents (EUR/ha)	2005	221.90	30.07	561.72	124.20	328.36	592.78
	2010	204.74	53.00	703.37	130.60	306.14	600.33
	2016	286.25	87.87	675.51	147.36	388.18	590.19
Wages (EUR/man-hour)	2005	9.03	1.64	11.50	9.76	9.09	17.68
	2010	10.04	2.59	13.35	11.02	10.47	22.26
	2016	13.87	2.75	15.12	12.23	12.19	22.95
Interest on capital (%)	2005	4.18	2.46	3.67	3.59	5.72	4.26
	2010	3.90	3.17	3.87	3.46	4.62	4.58
	2016	2.76	3.63	2.76	2.44	4.59	2.70

DE – Germany; PL – Poland; NL – Netherlands; FR – France; IE – Ireland; DK – Denmark

Source: Own elaboration based on EU FADN (2019)

of production (work, land, and capital), whether they are external or family factors. As a result, holdings can be compared irrespective of the family/non-family nature of the factors of production employed;

(2) Average farm income (FFI) in the group of dairy farms from selected countries (it equals to FNVA – total external factors + balance subsidies and taxes on investments). This measure shows the amount of remuneration for permanent family production factors, i.e. labour, land, and capital (in the case of legal persons it only deals with land and capital) and the remuneration for the risk (loss/profit) of the entrepreneur in the accounting year;

(3) Profitability of own labour (FL_1), calculated as the relation of farm income (FFI) to own and unpaid labour inputs (W). In the conducted analysis, it is quite difficult to determine the unpaid outlays of own labour of a farmer and his/her family, because nowadays work on a farm is not just physical activities, but it is also conceptual work. The article uses data from the FADN System and determines own work input (W) as the difference between "Labour input" (SE011) and "Paid labour input" (SE021);

(4) Profitability of own labour (FL_2) (relation of farm income (FFI) minus costs of own land (L) and capital (C) involvement in own labour inputs (W)). Although the indicated costs of involving own factors of production (land and capital) belong to the group of opportunity costs, they are important in calculating the competitive position of agricultural holdings, especially in the context of potential directions of changes. Therefore, it is necessary to determine the level of interest rate on the equity capital employed and potential agricultural area (AA) own lease prices. In this study, based on information from the EU FADN system about the costs of external factors, prices were calculated and used for calculations (Table 1).

According to Table 2, Danish farms were characterised by the highest net value added which reached EUR 186 062 in 2016, marking a 65% increase from 2005. Polish dairy farms occupied the other end of the spectrum, and the average net value added in 2016 was 13 times lower than in Denmark. However, Danish holdings lose their advantage when external factors of production (land, labour, and capital) are taken into account. In 2016, the average income of Danish agricultural holdings was only EUR 9 802 and was the lowest in the group of compared countries. This is a very interesting situation, resulting inter alia from the very large debt of Danish dairy farms. In 2016, the average share of loans and borrowings in equity was as much as 78%, which resulted in relatively high interest costs. Loans taken by Danish farmers are usually long-term and are related to the succession of farms by their successors. In addition, in Danish farms, significant costs are incurred for employing employees. This is due to the relatively large scale of production, which results in the need to hire employees, and relatively high labour prices (Asmild et al. 2012). The presented calculations show that the Danish dairy farms, despite the largest production scale among EU economies on average and relatively good technical equipment, were characterised by low profitability of their own work in the analysed period, which indicates a relatively low economic competitiveness. The highest farm incomes in 2016 were reported in Ireland (EUR 60 192) and Germany (EUR 40 640). Ireland's natural conditions

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Table 2. Selected indicators of economic efficiency in average dairy farms in selected EU countries in 2005, 2010 and 2016

Specification	Year	Selected EU countries					
		DE	PL	NL	FR	IE	DK
Farm net value added (EUR)	2005	53 735	8 851	84 110	43 132	51 750	112 745
	2010	72 747	14 073	109 629	58 612	61 203	192 451
	2016	74 931	13 744	71 569	43 192	70 879	186 062
Farm income (EUR)	2005	32 513	7 967	51 033	30 600	41 103	29 237
	2010	44 302	13 354	58 309	41 740	47 798	–14 453
	2016	40 640	12 891	26 730	23 175	60 192	9 802
Remuneration for family labor (EUR/hr) (FL_1)*	2005	9.95	2.15	14.15	11.63	12.69	10.12
	2010	13.69	3.36	15.88	15.39	14.17	–5.45
	2016	11.88	3.29	7.38	8.87	18.40	3.71
Remuneration for family labor (EUR/hr) (FL_2)**	2005	1.65	1.57	–6.98	8.67	–8.33	–14.20
	2010	4.49	1.80	–10.18	12.07	–6.30	–52.38
	2016	4.21	1.00	–11.29	6.05	–7.09	–28.84

DE – Germany, PL – Poland, NL – Netherlands, FR – France, IE – Ireland, DK – Denmark; *remuneration for family labour (FL_1) = farm income (EUR)/opportunity cost of family labour (man-hours); **remuneration for family labour (FL_2) = farm income – (opportunity costs of own capital and land (EUR))/opportunity cost of family labour (man-hours)

Source: Own elaboration based on EU FADN (2019)

are conducive to raising cattle and producing milk. The relatively long growing season and the availability of cheap feed contributes to achieving good economic results (Heinschink et al. 2016). According to calculations, the average farm income in the Polish dairy sector was EUR 12 891. The basic weakness of Polish dairy farms is the small scale of production. There were as many as 69% of farms keeping up to 15 cows in 2015.

Table 2 indicates that the average remuneration for family labour in dairy farms varied considerably in the compared countries. In Poland and Denmark, relatively low farm incomes were responsible for very low remuneration for family labour (FL_1). In the Netherlands, Ireland and Denmark, remuneration for family labour (FL_2) was negative when the opportunity costs of own land and capital were deducted from farm income.

SUMMARY AND CONCLUSIONS

The results of this study indicate that the competitiveness of Polish dairy farms in 2005–2016 relative to the top milk producing countries in the EU remained at an average level. Remuneration for family labour (excluding the opportunity costs of own land and capital) reached EUR 3.29/h in 2016, marking an increase of EUR 1.14/h from 2005. The observed increase was significant in percentage terms (44%), but based on the average remuneration of employees in the national economy in Poland (EUR 3.52/h in 2005; EUR 5.52/h in 2016), it should be noted that: (1) the profitability of work on dairy farms was lower than the average wage in the national economy, and (2) the wage in the national economy increased at a faster rate than the incomes in the dairy sector. Dutch, Danish, and Irish dairy farms incurred losses when the opportunity costs of own land and capital were taken into account in the calculation of remuneration for family labour. The best results were reported in German farms. In Poland, remuneration for family labour reached EUR 1/h in 2016, marking a decrease of EUR 0.57/h from 2005. The noted decrease can be attributed mainly to the growing prices of land (the average rent per hectare of land increased nearly threefold in the analysed period). The following conclusions can be formulated based on the presented findings: (1) the economic efficiency of dairy farms in the analysed EU countries will have to be improved due to relatively low remuneration for family labour (when compared with the average wage for work in the economy); and (2) the scale of production exerts a considerable impact on economic efficiency, including labour productivity, which will probably contribute to further consolidation of dairy farms and a reduction in the overall number of such farms.

Two indicators were used in this study to evaluate the competitiveness of dairy farms: farm net value added and farm income. In 2016, farm net value

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added was highest in Denmark (EUR 186 062) and Germany (EUR 74 931). In 2005–2016, the greatest increase in the above parameter was observed in Denmark (65%) and Poland (56.3%). Net value added decreased in the Netherlands in the analysed period (–14.8%). Polish farms were characterised by the lowest net value added among the compared countries, but this parameter increased steadily between 2005 and 2016. In 2016, farm income was highest in Ireland (EUR 60 192) and Germany (EUR 40 640) and lowest in Denmark (EUR 9 802). Between 2005 and 2016, dairy farm income increased at the highest rate in Poland (61.8%) and Ireland (46.4%), and decreased in Denmark (–64.5%), Netherlands (–47.6%) and France (–24.6%).

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