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CHALLENGES IN THE MILK MARKET (INVESTMENTS, DISRUPTIONS, LOGISTICS, COMPETITIVENESS, PRICES, AND POLICY)

Collective work, edited by  
Piotr Bórawski  
Andrzej Parzonko  
Ireneusz Żuchowski

## CHALLENGES IN THE MILK MARKET (INVESTMENTS, DISRUPTIONS, LOGISTICS, COMPETITIVENESS, PRICES, AND POLICY)

Wydawnictwo Ostrołęckiego  
Towarzystwa Naukowego  
im. Adama Chętnika  
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## DEVELOPMENT DIRECTIONS OF DAIRY FARMS IN POLAND<sup>5</sup>

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### 8.1. Introduction

The Polish dairy industry has undergone many changes in recent times. They were related to the transformation of the economic system, European integration, and globalization processes (Pietrzak and Roman 2014). As a result of European integration and opening to the single market, the Polish dairy sector had to make the necessary investments to improve its competitiveness. The number of dairy enterprises decreased from 292 in 2004 to 163 in 2019 (i.e. a decrease of 44.2%). In turn, employment in enterprises decreased from 42,913 in 2004 to 39,949 in 2019 (i.e. a decrease by 23.2%).

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The number of milk producers has also decreased. Farms with a small number of cows liquidated production, and milk yield increased after Poland's integration with the EU (Milk market 2004-2019).

Studies in the literature show that the situation on the milk market depends on many factors, which can be divided into exogenous (external) and endogenous (internal). These factors are interrelated, and it is difficult to capture the influence of only one variable, which makes it the resultant of many factors (Klusek 2003).

There are exogenous and endogenous factors shaping investments in dairy farms.

Exogenous-external factors are (Kusz 2018):

- Demographic conditions (growth of the world's population, industrialization and urbanization).
- Environmental conditions (scarcity and degradation of natural resources, cultural changes, increasing social pressure on environmental protection and protection of rural areas).
- Socio-cultural conditions resulting from demographic factors (system of values, preferences of buyers' behavior, level of use of adaptability, openness to technical innovations).
- Economic conditions (the rate of economic growth, the level of people's income, the level of prices, prices of production factors and their relations, inflation, unemployment, economic situation, the level of interest rates, tax tariffs, exchange rates, international trade, the situation of public finances).
- Technological factors: new scientific discoveries, public spending on research and development in agriculture, availability of new technologies).
- Institutional conditions (organizations, regulatory norms).
- Processes of globalization.

Endogenous-internal factors are (Kusz 2018):

- Resources and relations of production factors (land, labor and capital resources),
- Applied production technologies,
- Human capital,
- Financial situation and the level of obtained income,

- The relation of the farmer's family to the farm or organizational culture in the case of farms with hired labor,
- The degree of connection with the environment.

## 8.2. Aim and method of research

The main aim of the research was to evaluate the development of dairy farms in Poland.

The achievement of the main goal was possible because of the following specific goals:

- Getting to know the size of investments in dairy farms,
- Recognition of types of investments in dairy farms,
- Assessment of changes that occurred as a result of the investments carried out,
- Knowing the income of the researched farms.

The surveys were conducted in 293 dairy farms all over the country. The selection of farms was deliberate, and the researched farms had to meet the following criteria:

- Keeping dairy cows,
- Farmer's consent to conduct the survey,
- Investments implemented in 2004-2019.

Farms were divided into four groups depending on the number of cows on the farm (Table 1): 20 or less cows (60 farms -20,5%), 21-40 cows (115 farms-39.2%), 41-60 cows (58 farms-19.8%) and more than 60 cows (60 farms-20.5%).

Table 1. Number of cows in a farm

Number of cows	Number of farms	%
20 or less	60	20,5
21-40	115	39,2
41-60	58	19,8
More than 60	60	20,5
Total	293	100,0

Source: calculations based on own research (n = 293)

The geographic scope of the research covered dairy farms that carried out investments in the years 2004-2019 in the following voivode-ships: Podlaskie, Mazowieckie, Wielkopolskie, Warmińsko-Mazurskie, Kujawsko-Pomorskie and Pomorskie.

### 8.3. Research results and discussion

The average land area of farms increased with the increase in the number of cows on the farm and was the highest in entities with over 60 cows (Table 2). When analyzing the changes in the land area of the re-searched farms in 2019 compared to 2014, it can be concluded that the largest changes were in farms with 41 to 60 cows. The average farm area in these farms increased by 51%, and the area of arable land by 40.6%. In turn, the area of permanent grasslands increased the most in 2019 compared to 2014 on farms with the number of cows from 21 to 40 (25.9%) and from 41 to 60 cows (24.9%). Farms with the smallest number of cows reduced the area of arable land in 2019 compared to 2014 by 4.5%; in farms with 21 to 40 cows by 5.3%. The average area of agricultural holdings in 2019 increased by 16.9% compared to 2014.

The presented research proves the progressive concentration of production on dairy farms. Poland has good natural conditions for breeding and breeding dairy cows. However, according to Roman (2017), it was the Common Agricultural Policy (CAP) and the policy of Polish governments that had the greatest impact on improving the situation in the dairy sector.

Table 2. Area of researched farms depending on the number of cows

Number of cows	Average farmland		Arable land [ha]		Permanent grasslands [ha]	
	2014	2019	2014	2019	2014	2019
20 or less	27,08	28,20	17,38	16,60	9,7	11,6
21-40	34,5	37,0	20,60	19,5	13,9	17,5
41-60	44,9	67,8	24,40	42,2	20,5	25,6
More than 60	145,3	161,1	108,0	116,10	37,3	45,0
Average	62,90	73,50	42,6	59,9	20,4	24,9

Source: calculations based on own research (n = 293)



The research shows that the average number of cows increased from 44 to 53 in 2019 compared to 2014, and the number of calves increased from 30 to 36 (Table 3). When analyzing the changes that took place on dairy farms, taking into account the number of cows and calves, it should be stated that they were the largest in farms with the largest number of cows (increase by 24.7%), and the smallest in entities with the number of cows up to 20 (7.21 %).

The conducted research shows the progressive concentration of rearing and breeding of dairy cows. The increase in the number of cows takes place on the largest farms. It is from farms keeping a large number of cows that most of the milk purchased in Poland comes from. The concentration of milk production is the result of an increase in the quality requirements of dairies and the requirements of the common market (Seremak-Bulge 2005).

Table 3. Average number of milking cows and calves

Cows' number	Average number of milking		Average number of calves	
	2014	2019	2014	2019
20 or less	14	15	11	12
21-40	27	31	17	19
41-60	43	50	27	35
More than 60	93	116	65	76
Average	44	53	30	36

Source: calculations based on own research (n = 293)

The research shows that the number of cows on a farm impacted milk yield, which was the highest in farms with over 60 cows (8054.3 liters / cow). The lowest productivity observed in farms with the least number of cows (Table 4).

Comparing the results obtained from own research with the averages for Poland, it should be stated that they exceeded the national data. The average milk yield of cows in 2019 in Poland was (6,348 liters / head), and in cowsheds under control (8,530 l / head). The research shows that farms with up to 20 cows achieved performance similar to the national average.

The increase in milk yield of cows proves biological progress and the implementation of technical and organizational changes (Roman 2017). Also Ziętara and Adamski (2014) claim that the observed increase in milk yield of cows in Poland after accession to the EU is the result of not only the selection of cows but also changes in production technology.

Table 4. Milk yield of cows in the researched farms depending on the number of cows

Number of cows	Milk yield of cows in the researched farms depending on the number of cows [PLN]
20 or less	6049,5
21-40	7215,6
41-60	7661,2
60 and more	8054,3

Source: calculations based on own research (n = 293)

Investments are an important factor in the development of farms and the improvement of their competitiveness (Table 5). There are many definitions of investment in the literature on the subject. The most general was presented by Hirshleifer (1965), according to which it is a renunciation of current consumption in order to achieve future benefits. Research shows that the value of investment in machinery increased with the increase in the number of cows on the farm. The most frequently purchased farms in the surveyed farms were new tractors, balers, slurry tankers, seeders, trailers and others. Therefore, they were specialized machines that facilitate both plant and animal production as well as logistic processes on farms.

In addition to machinery, dairy farms must invest in upgrading fixed assets, animal welfare and environmental protection while increasing production levels to meet market competition. This direction of investments took place in many European Union countries, which was the result of the requirements related to integration (Bórawski and Pawlewicz 2006; Sass 2009).

Table 5. The value of investments in machines depending on the number of cows

Number of cows	The value of investments in machines depending on the number of cows [PLN]
20 or less	121561,7
21-40	252440,0
41-60	382823,1
60 and more	619587,6

Source: calculations based on own research (n = 293)

The key group of investments was the purchase of land (Table 6). Owing to such investments, farms increase the acreage and production volume. The research shows that the value was the highest in the group with the largest number of cows.

The implemented investments in dairy farms improve the efficiency of management, the level of modernity and the exchange of decapitalized production assets (Kusz 2018). The increase in investment outlays in Polish agriculture after accession to the EU was the result of greater availability of funds, easier access to solutions, direct payments, higher sanitary and epidemic standards for animals, environmental protection, and food safety and quality related to consumer requirements (Kusz 2009). Due to these and other factors, the value of investment outlays in agriculture increased from PLN 2,398,000. PLN in 2005 to 5,303.9 thousand. PLN in 2015 (Statistical Yearbook of Agriculture 2016).

Table 6. Value of land investment depending on the number of cows

Number of cows	Value of land investment depending on the number of cows [PLN]
20 or less	121561,7
21-40	252440,0
41-60	382823,1
60 and more	619587,6

Source: calculations based on own research (n = 293)

Another group of investments are investments in livestock, which allow for the reconstruction of the running and livestock (Table 7). They enable the introduction of new and more efficient animal breeds to farms. Generally, farmers purchase calf heifers which are used to repair their

livestock. The research shows that the value of the investment was the highest in the group with the largest number of cows and amounted to PLN 15,347.7. Taking into account the average price of a calf heifer of 7-10 thousand. PLN 15 347.7 means the purchase of an average of two calf heifers on farms with the largest number of cows.

The investments made are a key factor for the development of dairy farms in Poland. According to Bień (2008), the benefits of investments may have an economic, social and organizational dimension. The effects of the implemented investments will be observable in the longer term (Bień 2008). According to Ziętara and Adamski (2014), investments in dairy farms may increase the use of the production potential and the production of milk and live cattle, which may translate into increased exports of these products. In addition, the introduced investments in dairy farms may lead to an improvement in production capacity, production structure, farm profitability, improvement of the dairy industry's competitiveness and mitigation of differences in the sector's development (Kulawski 2016).

Table 7. Value of investments in animals depending on the number of cows on the farm

Number of cows	Value of investments in animals depending on the number of cows on the farm [PLN]
20 or less	2380,0
21-40	5078,8
41-60	4675,9
60 and more	15347,7

Source: calculations based on own research (n = 293)

Holding investments may benefit from financial support. Most often it is the Rural Development Program (RDP) in 2007-2014 and 2015-2020. The research shows that the value of co-financing (state aid) increased with the increase in the number of cows on the farm (Table 8). In addition to the RDP, there were many regulations on the milk market, including milk quotas, export subsidies, EU intervention stocks that influenced the situation and investments that were eventually liquidated (Grochowska 2017). In addition, the support system for dairy farms related to greening, redistribution of subsidies and subsidies to cattle and cows additionally positively affects the economic situation of farms and

the possibility of implementing investments (Kołoszyc and Śwityk 2015).

Table 8. The amount of co-financing for investments depending on the number of cows on the farm

Number of cows	The amount of co-financing for investments depending on the number of cows on the farm [PLN]
20 or less	84720,2
21-40	141639,9
41-60	187032,6
60 and more	244304,8

Source: calculations based on own research (n = 293)

With the collected information, it was possible to estimate the value of production and income in the researched dairy farms (Table 9). The results of this research data confirm previous analyzes. In general, farms with the largest number of cows had the highest production and income.

The increase in production on dairy farms is the result of good natural conditions in Poland, the concentration of herds, the production of cheap feed on the farm and the agrarian structure (Seremak-Bulge 2005).

Milk production is mainly influenced by such elements as the level of investments, resources, prices and costs (Śmigła 2014). The functioning of dairy farms determines their spatial distribution in different regions, economic value, and the efficiency of milk production. Dairy farms, due to the growing costs of means of production and increasing labor costs, increase the level of production (Adamski 2014).

Table 9. Total production in the researched farms depending on the number of cows

Number of cows	Animal production [PLN]		Plant production [PLN]	
	2014	2019	2014	2019
20 or less	135494,1	171780,5	93463,6	96194,3
21-40	283096,3	367930,4	144452,5	142542,2
41-60	456012,5	620230,6	479364,2	492189,3
60 and more	916701,8	1557695,0	928285,1	1018752,0

Source: calculations based on own research (n = 293)

Income is the most important category. Farmers spend their income on the development and functioning of the farm and to cover the

household needs of the family. Its value increased with the increase in the number of cows on the farm and was the highest in 2019 (PLN 563434.4). On the other hand, when analyzing the increase in family farm income depending on the number of cows in 2019 compared to 2014 (Table 10). It should be stated that it increased most in the group of entities with the largest number of cows (43.5%), to 20 %), then from 21 to 40 cows (18.45) and from 41 to 60 cows (12.8%).

The conducted research shows that the economic situation of the surveyed dairy farms improved in all groups in 2019 compared to 2014. After accession to the EU, the most important factors influencing farm income include: direct payments, faster income growth than costs and farm management skills by farmers and the use of CAP instruments (Bórawski 2013).

Table 10. Income from family farms

Number of cows	Income [PLN]	
	2014	2019
20 or less	53575,0	70673,0
21-40	162383,7	192383,7
41-60	217367,1	245162,0
60 and more	392577,9	563434,4

Source: calculations based on own research (n = 293)

## 8.4. Summary and conclusions

Changes in the surveyed farms were the result of actions taken by their owners, who increased the land area of farms in order to obtain their own feed and reduce production costs (Bórawski 2013). Increasing the land area of farms enables the improvement of economic and environmental performance. Activities undertaken by farmers aimed at increasing the land area in relation to the number of animals allowed for the implementation of the concept of sustainable development, greater environmental protection and the emission of less pollutants into the environment (Guth and Smędzik-Ambroży 2017).

Poland's accession to the EU had a positive effect on investments. Research by Grochowska (2015) shows that after accession to the EU,

Polish farmers invested mainly in machinery and equipment (36.5%), means of transport (28.2%), land purchase (10%) and buildings (3.4%). It should therefore be stated that the structure of investments in the researched farms was similar to the structure in Poland overall. The level of implemented investments was related to the increased scale of cow rearing.

In the case of dairy farms, the improvement in the economic situation in Poland compared to farms in other countries was the result of the cost advantage associated with lower opportunity costs of production factors (labor, land and capital) (Kołoszyc 2013). However, according to Sompolska-Rzechuła and Świtłyk (2016), the internal factors influencing the value of income of dairy farms, the area of agricultural land and the number of dairy cows are all important.

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