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**CONCENTRATION OF DAIRY COW BREEDING  
AND COMPETITIVENESS OF POLISH FARMS SPECIALIZED  
IN MILK PRODUCTION**

Key words: breeding concentration, dairy farms, profitability, competitiveness,  
profitability

**ABSTRACT.** The article presents reasons for farmers to increase concentration in dairy cow breeding. The most important concerns the decrease in the unit profitability of milk production caused by a faster growth rate of labor costs and prices of means of production purchased by farmers than the selling prices of agricultural products. The result of the trends was a decrease in the number of dairy farms and the number of cows. In 1996-2020, the number of dairy farms decreased by 85% (to 198 thousand), and the number of cows decreased by 28.7% (to 2,468 thousand units). As a result, the average size of a herd of cows increased from 2.64 in 1996 to 12.64 units in 2020. At the same time, the milk yield of cows increased by 85%. The territorial diversification of the cow population also deepened. In 2020, 69.2% of the cow population was located in the following voivodships: Mazowieckie (21.1%), Podlaskie (18.9), Wielkopolskie (13.0%), Warmińsko-Mazurskie (8.5%) and Łódzkie (7.7%). The analysis of the economic results of farms carried out in two periods 2008-2010 and 2018-2020 showed that farms with at least 24 cows with a total milk production of 129 tons in the first period and 144 tons of milk in the second period turned out to be able to compete. Farms with 62 cows with a total production of 494 tons of milk were fully competitive in the second period.

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## INTRODUCTION

Poland's integration with the European Union in 2004 contributed to increasing the productivity of Polish agriculture. Its measure is the level of market production of agriculture. In 2000–2020, this production increased 2.76 times (Table 1). Market animal production increased to a slightly lesser extent, by 2.62 times. The structure of this production category has changed slightly. The share of animal production decreased by 3.3 p.p. from 62.6 to 59.3%, it remained dominant. In the market structure of animal production, the share of milk production was significant, which in those years amounted to 31% on average, and approximately 42% including live cattle. Milk and milk products play a significant role in exports. About one-third (33%) of the total milk production is exported in the form of products, and the trade balance in the products in the analyzed years was positive and amounted to EUR 1,203.2 million in 2020 [Szajner 2022]. In the milk production sector, there was a concentration of production, manifested by a drastic decrease in the number of farms and the number of cows, especially dairy ones, with a simultaneous increase in the milk yield of milk cows in general after a temporary decrease after 1990.

The main reason for the concentration of milk production is a decrease in its unit profitability caused by a faster growth rate of labor costs and agricultural production resources than the selling prices of agricultural products. Figure 1 presents the development of labor costs in the national economy outside agriculture, costs of means of production purchased by farmers and selling prices of agricultural products in 1996–2020. The presented trends clearly show that in the analyzed period, salaries in non-agricultural

Table 1. Value of commercial agricultural production in 2000–2020 (current prices)

| Itemization                       | 2000        |       | 2010        |       | 2015        |       | 2020        |       |
|-----------------------------------|-------------|-------|-------------|-------|-------------|-------|-------------|-------|
|                                   | million PLN | %     | million PLN | %     | million PLN | %     | million PLN | %     |
| Commodity agricultural production | 33,491.4    | 100.0 | 59,357.1    | 100.0 | 74,202.7    | 100.0 | 92,495.3    | 100.0 |
| including livestock production    | 20,950.4    | 62.6  | 32,240.8    | 56.0  | 43,387.3    | 58.5  | 54,828.7    | 59.3  |
| Milk production                   | 6,725.4     | 32.1* | 10,691.1    | 33.2* | 12,212.4    | 28.1* | 16,911.4    | 30.8* |
| Beef cattle production            | 2,028.3     | 9.7*  | 35,88.9     | 11.1* | 5,329.7     | 12.3* | 6,269.3     | 11.4* |
| Total cattle production           | 8,753.7     | 41.8* | 14,280.0    | 44.3* | 17,542.1    | 40.4* | 23,180.7    | 42.2* |

\* Share in livestock production

Source: data of Statistical Yearbook of Statistics Poland [GUS 2002, 2021]

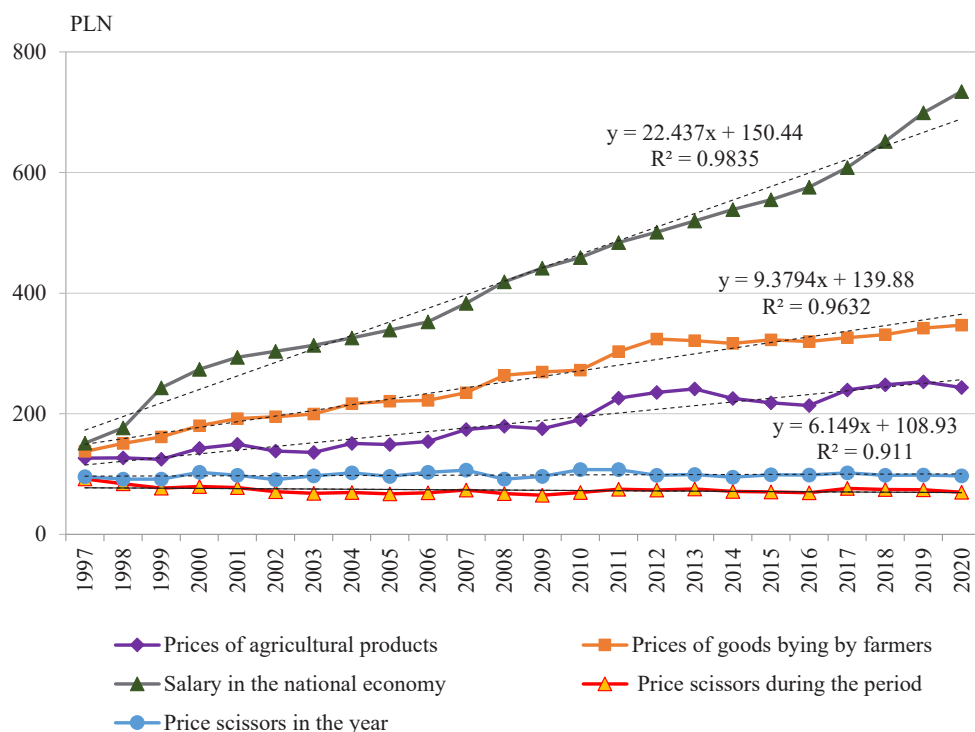


Figure 1. Trends in changes in labor costs in the national economy, costs of means of production for agriculture and selling prices of agricultural products in Poland in 1996-2020

Source: data of Statistical Yearbook of Statistics Poland [GUS 1997-2021]

divisions increased almost seven times. In the same period, the prices of means of production for agriculture increased about 3.5 times, and the prices of agricultural products about 2.5 times. Such trends are permanent regularities and occur in all market economy countries. The “price scissors” indicator was characterized by volatility, oscillating around 100%. On the other hand, in the entire period, the “price scissors” index was about 70%, which means that the prices of agricultural products in relation to the prices of means of production increased by 30% slower.

The faster growth of labor costs (wages in the national economy) and means of production than the selling prices of agricultural products caused a decrease in the unit profitability of agricultural products. In such a situation, farmers who want to achieve income from the farm at the parity level<sup>2</sup> are forced to increase the scale of production.

<sup>2</sup> Parity income – income comparable to remuneration in the national economy, except for agriculture. The increase in wages in the national economy causes parity deterioration.

They can achieve it by increasing the level of production intensity or at a given level of production intensity, by increasing their farm area in relation to plant production, and in animal production by increasing the number of animals kept. In such a situation, Polish milk producers increased the concentration of production by limiting the number of farms, increasing the scale of production within a farm and increasing the level of production intensity, which resulted in an increase in the milk yield of cows.

Concentration processes taking place in the milk producers sector have far-reaching organizational, economic and social effects. In such a situation, there is a need to study the reasons for the concentration and specialization of farms focused on milk production and the economic effects of the processes.

## MATERIAL AND RESEARCH METHODS

The main aim of the conducted research is to analyze the processes of concentration and specialization taking place in Polish farms focused on milk production and to determine its economic and social effects. The research period is variable, depending on the researched issue. Concentration processes in dairy farms were studied 1990-2000. The assumption of 1990 is related to the introduction of market economy principles this year after the change of the political and economic system that took place in 1989. Economic and social impacts were studied in 2008-2020, which was related to the availability of data. The basic source of research materials was statistical data published by Statistics Poland, data from dairy farms covered by FADN monitoring<sup>3</sup> in 2008-2020 and literature on the subject. The competitiveness of the surveyed dairy farms was determined by the competitiveness index (Wk) following Werner Kleinhanss [2015]<sup>4</sup>. The study used a descriptive and comparative method. Elements of tabular statistics were also used. The type of dairy farms was assumed as in FADN [Bocian et al. 2022] according to the structure of Standard Output SO (Standard Output).

<sup>3</sup> FADN – Farm Accountancy Data Network.

<sup>4</sup> The competitiveness index (multiplication) is the quotient of farm income and alternative costs of own production factors: land, labor and capital. The farmer's own labor costs were assumed on the basis of parity income, land costs according to the lease rent, capital costs according to the interest rate of ten-year bonds. Following Kleinhanss, the following classes of competitiveness index were assumed: Wk – in the case of negative farm income (Wk1);  $0 < Wk < 1$  partial coverage of own costs of production factors (Wk2);  $1 = Wk < 2$  full coverage of own costs of production factors (Wk3);  $Wk \geq 2$  double and greater coverage of own costs of production factors (Wk4). Wk1 and Wk2 farms unable to compete; Wk3 farms capable of competition; Wk4 fully competitive farms.

## CHANGES IN THE NUMBER OF DAIRY FARMS, COW UNITS AND MILK PRODUCTION

Changes in the number of farms with cattle breeding in the years 1996-2020 are presented in Figure 2. The number of farms keeping cattle (by 80%), including cows (by 85%), decreased significantly in this period. The structure of farms also changed. In 1996, the share of farms keeping cows in the total number of farms keeping cattle was very high and amounted to 95.2%, while in 2020 it decreased to 72.2%. The reason for the differences was the increased level of specialization of dairy farms. In the analyzed period, the number of cows gradually decreased from 3,461 thousand to 3,461 thousand in 1996 and to 2,468 thousand in 2020. The decrease was by 28.7%. Changes in the total cattle stock were smaller. After a temporary decrease by 23.5% until 2004, a gradual increase took place. In 2020, the difference, as compared to 1996 was 9.9%. The faster rate of the decrease in the number of farms than the decrease in the number of cows resulted in an increase in the average size of a cow herd, from 2.64 in 1996 to 12.45 units in 2020. Despite a significant increase in the average size of a cow herd, the distance to selected Western European countries is very large. In 2016, the average herd size of cows was in countries such as: Denmark – 178, the Netherlands – 97, Great Britain – 92, Germany – 62, France – 57 cows. The average herd size of cows in the European Union was 20 cows [BMEL 2020].

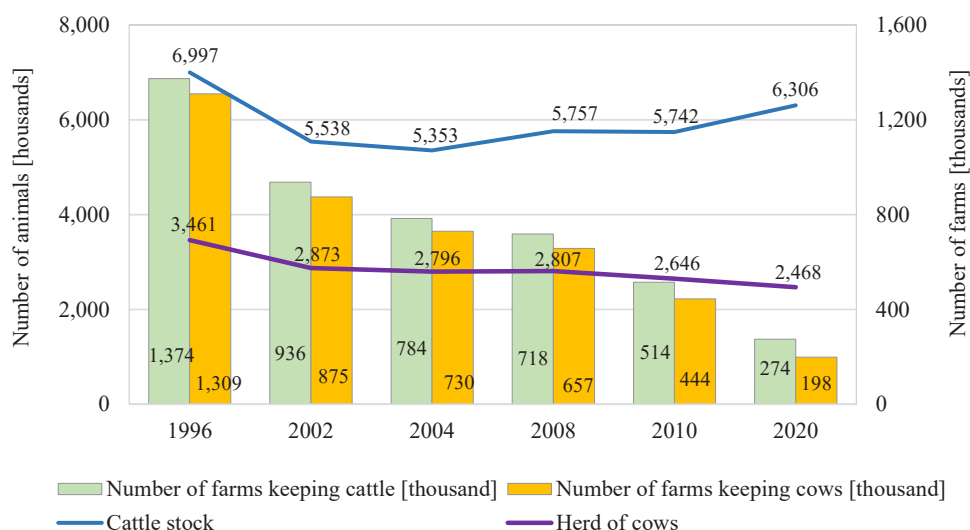


Figure 2. Number of farms keeping cattle, including cows, number of cattle, including cows in Poland in 1992-2020

Source: data of Statistical Yearbook of Statistics Poland [GUS 1996-2021]

The decrease in the number of cows was related to an increase in the milk yield of cows and changes in the level of milk production. The trends in this regard are shown in Figure 3. The presented data shows that the largest decrease in the number of cows were recorded in 1990-1995, amounting to 27.2%. In the subsequent five-year periods, the decrease in the number of cows was smaller. It was respectively: 13.5% (2000/1995), 9.8% (2005/2000), 5.4% (2010/2005) and 7.6% (2015/2010). In 2020, the number of cows increased by 0.9%, as compared to 2015 (2020/2015). The decrease in the number of cows in the entire analyzed period was 49.8%.

Milk production in 1990-2020 decreased by 6.3%, from 15,371 thousand tons to 14,400 thousand tons. The lowest level of milk production took place in 1995, and it was 11,303 thousand tons. The difference between the rate of decrease in the number of cows (by 49.8%) and milk production (by 6.3%) resulted from of the increase in milk yield of cows, which increased from 3,151 liters of milk per cow per year in the period to 5,834 liters in 2020. The increase was 85.1%. It resulted not only from cow selection but also changes in milk production technology, mainly feeding and keeping [Parzonko 2013].

In 1990-2020, there were significant changes in the spatial distribution of the cow population (Table 2). In 1990, 50.6% of the cow population was recorded in the following 5 voivodships: Mazowieckie (13.4%), Wielkopolskie (10.0%), Podlaskie (9.6%), Małopolskie (9.2%) and Lubelskie (8.4%). In 2020, 69.2% of the cow population was recorded in the following voivodships: Mazowieckie (21.1%), Podlaskie (18.9%), Wielkopolskie (13.0%), Warmińsko-Mazurskie (8.5%) and Łódzkie (7.7%).

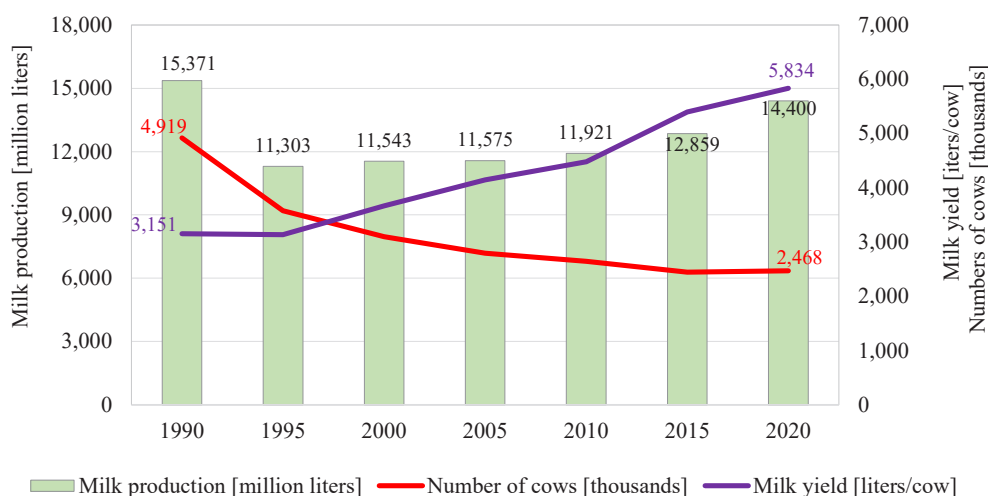


Figure 3. Cattle population, milk production and milk yield of cows in 1990-2020

Source: data of Statistical Yearbook of Statistics Poland [GUS 1991-2021]

Table 2. Territorial distribution of cows in Poland in 1990 and 2020 (by voivodeships)

| Voivodeships        | Distribution of cows |       |          |       |                 |
|---------------------|----------------------|-------|----------|-------|-----------------|
|                     | 1990                 |       | 2020     |       |                 |
|                     | thousand             | %     | thousand | %     | unit/100 ha UAA |
| Dolnośląskie        | 189.0                | 3.8   | 42.1     | 1.7   | 4.7             |
| Kujawsko-pomorskie  | 301.0                | 6.1   | 154.4    | 6.3   | 14.7            |
| Lubelskie           | 411.0                | 8.4   | 141.0    | 5.7   | 10.3            |
| Lubuskie            | 109.0                | 2.2   | 33.0     | 1.3   | 7.8             |
| Łódzkie             | 357.0                | 7.3   | 188.4    | 7.7   | 19.3            |
| Małopolskie         | 453.0                | 9.2   | 85.4     | 3.5   | 15.6            |
| Mazowieckie         | 657.0                | 13.3  | 520.4    | 21.1  | 26.5            |
| Opolskie            | 118.0                | 2.4   | 44.7     | 1.8   | 8.7             |
| Podkarpackie        | 283.0                | 5.7   | 38.9     | 1.6   | 6.9             |
| Podlaskie           | 471.0                | 9.6   | 467.7    | 18.9  | 43.7            |
| Pomorskie           | 216.0                | 4.4   | 72.3     | 2.9   | 9.5             |
| Śląskie             | 229.0                | 4.7   | 48.8     | 2.0   | 12.6            |
| Świętokrzyskie      | 336.0                | 6.9   | 53.2     | 2.1   | 10.8            |
| Warmińsko-mazurskie | 142.0                | 2.9   | 210.8    | 8.5   | 20.7            |
| Wielkopolskie       | 493.0                | 10.0  | 319.9    | 13.0  | 18.1            |
| Zachodniopomorskie  | 154.0                | 3.1   | 47.1     | 1.9   | 5.3             |
| Total/average       | 4,919.0              | 100.0 | 2,468.1  | 100.0 | 18.8            |

Source: data of Statistical Yearbook of Statistics Poland [GUS 1991, 2021]

Marcin Stanuch and Krzysztof Firlej [2021] also point to the problem of regional differences in the cow population in Poland.

In the analyzed period, the number of cows decreased by 49.8%. An increase in livestock was recorded only in Warmińsko-Mazurskie, by 48.5%, and in Podlaskie the number of cows decreased by 0.7%. The largest decreases in the number of cows occurred in the following voivodeships: Podkarpackie (-86.2%), Małopolskie (-81.1%), Świętokrzyskie (-84.1), Dolnośląskie (-78.0%) and Śląskie (-78.7%). There were also significant changes in the density of cows per 100 ha of UAA. The average density in 1990 was 26.3 cows, while in 2020 only 16.8 cows. The decrease was 36.1%. The highest density of cows in 2020 was recorded in the following voivodeships: Podlaskie, Mazowieckie and Wielkopolskie, where it was respectively: 43.7, 26.5 and 20.7 cows per 100 ha of UAA. The lowest was recorded in the following voivodeships: Dolnośląskie, Zachodniopomorskie and Podkarpackie, respectively: 4.7, 5.3 and 6.9 cows per 100 ha of UAA.



## COMPETITIVENESS AND EFFICIENCY OF POLISH DAIRY FARMS

In the article, competitiveness of dairy farms will be understood as their ability to develop in the conditions of a given country. Farms capable of development should be considered those which obtain positive income from management, i.e. obtain positive income from the farm, which will cover the so-called opportunity costs, i.e. costs of using own factors of production (labor, land and capital). Other authors define the development capacity of farms in a similar way, e.g. Wojciech Józwiak [2009].

The results of the studies conducted so far indicate that Polish dairy farms have competitive advantages over farms from other European countries. Comparative studies conducted by Ewa Kołoszycz indicate that in 2006-2009 Polish dairy farms gained a cost advantage over leading milk producers in the European Union, such as German, French or Dutch farms. However, in the next two years, 2010-2011, they lost this advantage [Kołoszycz 2013]. According to the same author, throughout 2006–2011, Polish dairy farms incurred lower opportunity costs of their own factors of production (labor, land and capital). Wojciech Ziętara's research also indicates the cost advantage of Polish dairy farms, as compared to medium-sized farms associated in the European Dairy Farmers association (EDF)<sup>5</sup>. They did not maintain this advantage in relation to the best farms (upper quartile covering 25% of farms achieving the best results). The results of the studies also indicate a decreasing difference in milk purchase prices in Poland in relation to EU-15 countries. However, their agricultural income per 100 kg of milk was comparable to that of the group [Ziętara 2012, 2013, Ziętara, Adamski 2014]. The results of the studies also indicate a decreasing difference in milk purchase prices in Poland in relation to the EU-15 countries. In 2004, milk purchase prices in Poland were by 38.5% lower, in 2010 by 12.2%, and in 2019 by 9.0% lower [Szajner 2022].

Tables 3 and 4 present numbers characterizing the relationship between the scale of production and the characteristics of dairy farms covered by FADN monitoring in 2008-2012 and 2018-2020. Average values of features from three-year periods were used. The surveyed farm groups were divided into classes according to the number of kept cows.

The following 6 classes are distinguished: 5-10, 10-15, 15-20, 20-30, 30-40 and 40 and more cows. The analysis of the figures given in Tables 3 and 4 shows the following statements regarding both periods:

1. There is a positive relationship between the number of kept cows and the area of farms.
2. The stocking density of cattle expressed in LU per 100 ha of UAA also increases. In the first period, it increased from 77.4 LU in the 5-10 ha class to 119.5 LU in the class of 40 cows and more. The difference is 54.4%, while in the second period it was higher, ranging from 86 LU to 158.6 LU per 100 ha of UAA.

<sup>5</sup> EDF – European Dairy Farmers.

Table 3. Production scale and economic effects of dairy farms in 2008-2010 (average)

| Itemization                           | Farms by number of cows [heads] |        |        |       |        |        |
|---------------------------------------|---------------------------------|--------|--------|-------|--------|--------|
|                                       | 5-10                            | 10-15  | 15-20  | 20-30 | 30-40  | > 40   |
| Farm area [ha of UAA]                 | 13.5                            | 18.8   | 26.2   | 31.6  | 44.9   | 66.4   |
| Number of cows [head/farm]            | 7.6                             | 12.5   | 17.3   | 24.2  | 33.7   | 55.4   |
| Cattle density [LU/100 ha of UAA]     | 77.4                            | 91.5   | 100.7  | 108.0 | 114.0  | 119.5  |
| Forage area [ha/LU]                   | 0.68                            | 0.60   | 0.57   | 0.57  | 0.55   | 0.54   |
| Milk yield [kg/cow]                   | 4,033                           | 4,257  | 4,733  | 5,327 | 5,657  | 6,155  |
| Milk production [t/farm]              | 30.9                            | 53.0   | 82.0   | 129.1 | 190.8  | 341.6  |
| Purchase price of milk [PLN/100 kg]   | 86.0                            | 90.3   | 95.3   | 99.3  | 101.7  | 109.3  |
| Farm income [PLN thousand]            | 19.24                           | 35.00  | 51.27  | 86.21 | 118.19 | 227.21 |
| Farm income [PLN thousand/FWU]        | 11.37                           | 19.37  | 27.00  | 44.27 | 58.20  | 103.83 |
| Management income [PLN thousand/farm] | -34.18                          | -26.87 | -18.49 | 7.41  | 24.92  | 108.95 |
| Competitiveness index                 | 0.36                            | 0.56   | 0.73   | 1.09  | 1.27   | 1.92   |
| Share of subsidies in income [%]      | 78.21                           | 54.39  | 43.89  | 35.29 | 30.38  | 26.77  |

Source: [Goraj et al. 2010, 2011, 2012]

3. With the increase of the scale, the fodder area per 1 LU of cattle decreased. In the first period, the difference between the extreme classes was 20.6%, while in the second period it was 30.7%. The data indicates a higher degree of professionalization of production on farms with a higher scale of production.
4. With the increase in the scale of cow breeding, the milk yield of cows increases. In the first period, the yield was in the range of 4,033-6,155 liters, and in the second period in the range of 4,374-7,881 liters per cow per year. In the first period, the difference between the extreme classes was 52.6%, while in the second, it was 80.1%. What is more, in the second period, the unit productivity of cows was higher. In the smallest class, keeping 7.6 cows, it was higher by 8.0%, while in the largest class, keeping more than 50 cows, it was higher by 28.0%.
5. Together with the increase in the scale of cow breeding, the production of milk from the farm increased. The increase in milk production in the second period in farms with a smaller scale (up to 15 cows) was 12%, while in the class with the largest scale (over 50 cows) it was higher and amounted to 44.7%.

Table 4. Production scale and economic effects of dairy farms in 2018-2020 (average)

| Itemization                                | Farms by number of cows [heads] |        |       |        |        |        |
|--|---------------------------------|--------|-------|--------|--------|--------|
|  | 5-10                            | 10-15  | 15-20 | 20-30  | 30-40  | > 40   |
| Farm area [ha of UAA]                      | 14.1                            | 19.2   | 24.2  | 30.5   | 39.2   | 62.5   |
| Number of cows [head/farm]                 | 7.6                             | 12.5   | 17.4  | 24.4   | 34.5   | 62.4   |
| Cattle density [LU/100 ha of UAA]          | 86.0                            | 102.4  | 112.9 | 127.3  | 140.1  | 158.6  |
| Forage area [ha/LU]                        | 0.65                            | 0.58   | 0.54  | 0.51   | 0.49   | 0.45   |
| Milk yield [kg/cow]                        | 4,374                           | 4,733  | 5,395 | 5,902  | 6,600  | 7,881  |
| Milk production [t/farm]                   | 32.95                           | 59.42  | 94.42 | 144.41 | 239.25 | 494.33 |
| Purchase price of milk [PLN/100 kg]        | 1.13                            | 1.17   | 1.23  | 1.28   | 1.33   | 1.39   |
| Farm income [PLN thousand]                 | 30.70                           | 54.22  | 79.73 | 120.0  | 174.52 | 351.90 |
| Farm income [PLN thousand/FWU]             | 18.38                           | 30.76  | 42.76 | 62.48  | 85.14  | 162.18 |
| Income from management [PLN thousand/farm] | -44.16                          | -26.57 | -6.28 | 26.84  | 72.25  | 234.94 |
| Competitiveness index                      | 0.41                            | 0.67   | 0.92  | 1.29   | 1.70   | 3.00   |
| Share of subsidies in farm income [%]      | 86.91                           | 64.97  | 56.52 | 45.33  | 37.67  | 27.57  |

Source: [Bocian et al. 2020, 2021, 2022]

6. Selling prices of milk were positively related to the increase in the scale of farming. In the first period, the difference between the extreme classes was 2.7%, while in the second it was 23%.
7. Farm income in total and per farmer's and his family members' own labor input unit (FWU) was also positively correlated with the farming scale. In farms with up to 15 cows, parity income was not achieved, which in the first period amounted to PLN 24.8 thousand PLN/FWU, while in the second 39.2 thousand PLN/FWU [Cholewa 2011, Skarżyńska et al. 2020].
8. Negative management income were recorded in both periods in farms of the first three classes, keeping herds of up to 20 cows. Only farms with more than 20 cows (24) obtained positive management income. At the same time, in the farms, the competitiveness index was higher than "1", which indicates the ability to compete.

In the first period, farms of the last three classes, where cow herds ranged from 24.2 to 55.4 units, showed the ability to compete. In the second period, farms with 62.4 cows and annual milk production of 494.3 tons of milk were fully competitive. The competitiveness index in this class of farms was 3.0.

9. The share of subsidies in farm income was negatively correlated with the scale of cow breeding. In the first period it was in the range of 78.21-26.77%, while in the second period it was slightly higher, in the range of 86.91-27.57%. The data indicates a greater dependence of farm income in the second period.

## SUMMARY AND CONCLUSIONS

The introduction of the principles of market economy after the political changes that took place in 1989 resulted in far-reaching changes in the entire economy, including agriculture. The faster growth rate of labor costs (mainly salaries) in the national economy and prices of means of production for agriculture than the selling prices of agricultural products caused a decrease in the unit profitability of agricultural production, which intensified production concentration and specialization. In the production of milk, which is an important element of commercial production in agriculture, there was a decrease in the number of dairy farms and the number of cows kept. The result was an increase in the average herd size of cows from 2.64 heads in 1996 to 12.45 heads in 2020. Despite this increase, the average herd size of cows in Poland was about 38% lower than the average in the European Union, which was 20 heads. Differences in relation to the leading milk producers in the EU, such as Denmark, the Netherlands and Germany, were much greater. Polish herds were smaller than in the mentioned countries by: 93%, 87% and 80%. Despite the decrease in the number of dairy farms, global milk production in 2020 amounted to 14,400 million liters and was 9% lower than the production in 1990. This was due to the increase in milk yield of cows by 85%. The territorial differentiation of the cow population intensified. In 2020, 69.2% of the cow population was recorded in the following voivodeships: Mazowieckie (21.1.0), Podlaskie (18.9), Wielkopolskie (13.0%), Warmińsko-Mazurskie (8.5) and Łódzkie ( 7.7%). The largest decreases in the number of cows occurred in the following voivodeships: Podkarpackie (-86.2%), Małopolskie (-81.1%), Świętokrzyskie (-84.1), Dolnośląskie (-78.0%) and Śląskie (-78.7%).

The scale of milk production is the basic factor determining the efficiency and competitiveness of dairy farms. The number of cows is positively related to: milk yield of cows, farm milk production, milk purchase price, farm income, labor profitability of the farmer and his family members, competitiveness index. Forage area per 1 LU of cattle and the share of subsidies in farm income are negatively correlated with the number of cows.

The conducted analysis enables the following conclusions to be drawn:

1. The decreased number of dairy farms concerned those with a smaller scale of cow rearing, i.e. keeping herds of up to 20 cows.
2. In farms with this scale of production, there was a negative income from management, which means that the farm income did not cover the costs of using own production factors: labor, land and capital. The competitiveness index in the farms was lower than 1, which indicates their uncompetitiveness. It is highly probable that in the medium term, farms with such a scale of cow production will drop out of milk production.
3. Dairy farms with 20-30 cow herds and minimum milk production of about 144 tons of milk per farm have development opportunities. The farms are able to compete.
4. Dairy farms with herds of more than 60 cows and a total milk production of 494 tons can be considered fully competitive dairy farms.
5. A further decrease in the number of dairy farms should be expected with a simultaneous increase in the scale of farming.

## BIBLIOGRAPHY

- BMEL. 2020. *Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten*. Bundesministerium für Ernährung und Forsten.
- Bocian Monika, Dariusz Osuch, Adam Smolik. 2020, 2021, 2022. *Parametry techniczno-ekonomiczne według grup gospodarstw uczestniczących w Polskim FADN w latach 2018, 2019 i 2020* (Technical and economic parameters by groups of farms participating in the Polish FADN in 2018, 2019, 2020). Warszawa: IERiGŻ-PIB.
- Cholewa Marcin. 2011. *Produkcja, koszty i dochody z wybranych produktów rolniczych w latach 2009-2010* (Production, costs and income from selected agricultural products in 2009-2010.) Warszawa: Wydawnictwa IERiGŻ PIB.
- Goraj Lech, Monika Bocian, Dariusz Osuch, Adam Smolik. 2010, 2011, 2012. *Parametry technicznoekonomiczne według grup gospodarstw uczestniczących w Polskim FADN w latach 2008, 2009, 2010*. (Technical and economic parameters by groups of farms participating in the Polish FADN in 2008, 2009, 2010). Warszawa: IERiGŻ-PIB.
- GUS (Central Statistical Office). *Roczniki statystyczne za lata 1968-2021* (Statistical yearbooks of Statistics Poland, years 1968-2021). Warszawa: GUS.
- Józwiak Wojciech. 2009. Zdolność konkurencyjna polskich gospodarstw rolnych w zestawieniu z gospodarstwami niemieckimi i węgierskimi. [W] *Sytuacja ekonomiczna, efektywność funkcjonowania i konkurencyjność polskich gospodarstw osób fizycznych* (Competitive ability of Polish farms in comparison with German and Hungarian farms. [In] *Economic situation, efficiency and competitiveness of Polish farms of natural persons*), ed. W. Józwiak, 51-90. Warszawa: IERiGŻ-PIB.

- Kleinhanss Werner. 2015. Konkurencyjność głównych typów gospodarstw rolniczych w Niemczech (Competitiveness of the main types of farms in Germany). *Zagadnienia Ekonomiki Rolnej* 1: 25-41. DOI: 10.5604/00441600.1146869.
- Kołoszycz Ewa. 2013. Dochodowość typowych gospodarstw mlecznych w świecie w latach 2006-2011 (Profitability of typical dairy farms in the world in 2006–2011.) *Roczniki Naukowe Ekonomii Rolnictwa i Rozwoju Obszarów wiejskich* 100 (1): 119-129.
- Parzonko Andrzej. 2013. Regionalne zróżnicowanie produkcji mleka w Polsce – uwarunkowania przyrodnicze i ekonomiczne (Regional diversification of milk production in Poland – natural and economic conditions). *Roczniki Naukowe SERIA XV* (2): 265-270.
- Skarżyńska Aldona, Irena Augustyńska, Magdalena Czułowska, Łukasz Abramczuk. 2020. Produkcja, koszty i dochody wybranych produktów rolniczych w latach 2018-2019 (Production, costs and income of selected agricultural products in 2018-2019) IERiGŻ PIB.
- Stanuch Marcin, Krzysztof Jan Firlej. 2021. Ocena porównawcza produkcji i cen mleka krowiego w państwach członkowskich Unii Europejskiej (Comparative assessment of the production and prices of cow's milk in the Member States of the European Union). *Zagadnienia Ekonomiki Rolnej/Problems of Agricultural Economics* 368 (3): 125-140. DOI: 10.30858/zer/138655.
- Szajner Piotr. 2022. Rynek mleka – stan i perspektywy (Milk market – state and prospects). [In] *Analizy rynkowe nr 63* (Market Analysis No. 63). Warszawa: IERiGŻ-PIB.
- Ziętara Wojciech. 2012. Koszty i dochodowość produkcji mleka w polskich gospodarstwach w latach 2006-2010. [W] *Analiza efektywności produkcji mleka i żywca wołowego* (Costs and profitability of milk production in Polish farms in 2006-2010. [In] *Analysis of milk and beef production efficiency*), eds. M. Świtłyk, W. Ziętara, 83-96. Warszawa: SGGW.
- Ziętara Wojciech. 2013. Opłacalność produkcji mleka w zależności od wybranych czynników. [W] *Obecne problemy produkcji mleka i wołowiny w Polsce i na świecie* (Profitability of milk production depending on selected factors. [In] *Current problems of milk and beef production in Poland and in the world*), 109-123. Conference “XXI Szkoła Zimowa Hodowców Bydła”. Kraków: Zespół Wydawnictw i Poligrafii IŻ-PIB.
- Ziętara Wojciech, Adamski Marcin. 2014. Skala produkcji, efektywność i konkurencyjność polskich gospodarstw wyspecjalizowanych w produkcji mleka (Production scale, efficiency and competitiveness of Polish farms specializing in milk production). *Zagadnienia Ekonomiki Rolnej* 1: 97-115.

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## KONCENTRACJA CHOWU KRÓW MLECZNYCH I KONKURENCYJNOŚĆ POLSKICH GOSPODARSTW WYSPECJALIZOWANYCH W PRODUKCJI MLEKA

Słowa kluczowe: koncentracja chowu, gospodarstwa mleczne, opłacalność,  
konkurencyjność, dochodowość

**ABSTRAKT.** W artykule przedstawiono przesłanki skłaniające rolników do zwiększania koncentracji w chowie krów mlecznych. Do najważniejszych należy zaliczyć spadek jednostkowej opłacalności produkcji mleka spowodowany szybszym tempem wzrostu kosztów pracy i cen środków produkcji nabywanych przez rolników od cen zbytu produktów rolnych. Skutkiem tych tendencji było zmniejszenie się liczby gospodarstw mlecznych i liczby krów. W latach 1996-2020 liczba gospodarstw mlecznych zmniejszyła się o 85% (do 198 tysięcy), a liczba krów o 28,7% (do 2468 tysięcy sztuk). Wskutek tego zwiększyła się średnia wielkość stada krów – z 2,64 w 1996 roku do 12,64 sztuk w 2020 roku. Jednocześnie nastąpił wzrost mleczności krów o 85%. Pogłębiło się także terytorialne zróżnicowanie pogłowia krów. W 2020 roku 69,2% pogłowia krów znajdowało się w województwach: mazowieckim (21,1%), podlaskim (18,9%), wielkopolskim (13,0%), warmińsko-mazurskim (8,5%) i łódzkim (7,7%). Analiza ekonomicznych wyników gospodarstw dokonana w dwóch okresach 2008-2010 i 2018-2020, wykazała, że zdolnymi do konkurencji okazały się gospodarstwa utrzymujące przynajmniej 24 krowy o łącznej produkcji mleka wynoszącej w pierwszym okresie 129 ton, a w drugim 144 tony mleka. W drugim okresie w pełni konkurencyjnymi były gospodarstwa utrzymujące 62 krowy, przy łącznej produkcji wynoszącej 494 tony mleka.

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