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ISBN 978-83-62775-45-3

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

Collective work, edited by
Piotr Bórawski
Andrzej Parzonko
Ireneusz Żuchowski

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Wydawnictwo Ostrołęckiego
Towarzystwa Naukowego
im. Adama Chętnika
w Ostrołęce 2021

Ostrołęckie Towarzystwo Naukowe

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Ostrołęka 2021

Recenzenci – Reviewers
TOMASZ ROKICKI
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ISBN 978-83-62775-45-3

The monograph was written by the project funded by the National Science Centre in Poland allocated on the project OPUS 15, number of the project: 2018/29/B/HS4/00392.

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im. Adama Chętnika
Ostrołęka 2021

180 publikacja Ostrołęckiego Towarzystwa Naukowego im. Adama Chętnika

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Druk: Drukarnia Kamil Borkowski, Łomża

9

THE ROLE OF INVESTMENTS AND TECHNICAL PROGRESS IN THE MODERNIZATION PROCESS OF MILK FARMS IN POLAND[6]

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9.1. Introduction

For nearly two decades, Polish agriculture has undergone rapid changes, which were possible thanks to economic growth, and above all thanks to the support of the European Union. At that time, funds from the Sectoral Operational Program – Agriculture were launched. For the years 2007-2013, the Rural Development Program for farmers was prepared, which helped EU agriculture to modernize. The process of modernizing Polish agriculture was started. The condition of utility rooms

[6] This paper was funded by the project financed by the National Science Center (NCN) in Poland, Project OPUS 15, Project No.:2018/29/B/HS4/00392.

was improved and farms were equipped with new machines and tractors. Access to the programs assumed the implementation of the objectives included in the priority axes, which are the economic, environmental, and social axes. In the next budget period, 2014-2020, the focus was on supporting the competitiveness of farms, mainly through the modernization of agriculture. The support was estimated at EUR 13.6 billion, of which EUR 2.5 billion will be allocated to the modernization of farms. The common agricultural policy of the EU is faced with the challenge of eliminating the imperfections that occur. Support aimed at increasing the efficiency of Polish agriculture is important from the point of view of maintaining human resources in agricultural activity, but primarily to ensure food security (Wicki and Pietrzykowski 2018).

Due to the growing competition on the international market, it is necessary to increase the quality of the goods and services offered. In order to improve the competitiveness of Polish agriculture, it is necessary to have modern technical facilities. Therefore, it is up to farms to introduce continuous changes leading to their modernization, i.e., transformations that result in progressive actions (Babuchowska and Marks-Bielska 2012).

Dairy cattle rearing is one of the dominant agricultural activities in Poland. This is due to the high demand for milk and dairy products in our country. Milk is a foundational food. Although milk as a finished product and a raw material for the production of other dairy products, there is considerable competition on the market. As a result, farms are faced with the need to adapt to market requirements. To improve the economic situation, dairy farms in Poland have achieved greater specialization and concentration of production (Czułowska and Abramczuk 2016).

Data from the Central Statistical Office of Poland from 2015 show the largest concentration of cows breeding and milk production was in Mazowsze and Podlasie. The smallest number of dairy farms were located in Małopolska and Pogórze. Farms based on the rearing of dairy cows are the foundation of the dairy product supply chain. "In Poland, the food chain can be divided into several main branches, e.g., milk and dairy products, meat, cereals, sugar, potatoes, oils, vegetables and fruit" (Sznajder 2008).

However, it is important that farms contributing to the creation of the value of a given product are the first link in the food supply chain (Czułowska and Abramczuk 2016).

9.2. Aim and methodology

The aim of the research was to obtain information about the investments made in the farms that were researched and the changes that have taken place in the technical equipment of dairy farms in Poland.

The subject of the work is technical equipment of selected dairy farms. In addition, important issues are also investments in farms, production costs, and the presentation of the changes taking place.

The research concerned changes that have occurred in farms in Poland in recent years. The research was conducted using questionnaires addressed to the owners of 373 farms. The time scope of the research covered the years 2014-2020. The questions dealt with milk production, animal husbandry, buildings, machines and general conditions on the farm. In addition, the survey provided information on farm investments and the use of funds from the Rural Development Program.

9.3. Characteristics of surveyed farms

The breeding of dairy animals in our country has a long tradition of agricultural production. This is influenced, among others, by favorable natural conditions and a strong work force. Poland is in fourth place in the ranking of EU milk producers. Germany is the leader in production, however, the member states are quite diverse (Będzikowska 2015).

For comparison, in 2010, there were 89.8 thousand of dairy farms in Poland. Germany had 425.8 thousand, and the Netherlands 19.8 thousand. The average herd of cows in Poland consisted of 6 cows, in Germany 46 and in the Netherlands 75. Whether milk production would bring the expected profits depends on the price received, as well as the scale and costs of milk production. The production scale consists of: "the size of the farm, the number of cows and their unit capacity, which translates into annual production." To make it possible to profit from milk production, agricultural calculations should be used. Thanks to them, the

costs and effects of production are calculated. Such calculations address what activities are profitable, for what quantities and with what method. Both actual and predicted data are used for these measurements (Będzikowska 2015).

The table 1 below presents the stock of dairy cows in the researched farms. 20.5% of the respondents had 20 cows and less. From 21-40 cows were owned by 39.2% of the surveyed farmers. This is the largest number of farms. Herds of 60 cows and more were on 20.5% of the farms studied.

Table 1. Characteristics of surveyed farms

Number of cows	%
20 or less	20,5
21-40	39,2
41-60	19,8
61 or more	20,5
Total	100,0

Source: own elaborations on the basis of surveyed farms

Figure 1 shows the milk production obtained in the researched farms. The highest number of liters of milk per cow (8054.3 liters) was obtained on farms with 60 or more cows. This reflects the modernity and efficiency ot these farms.

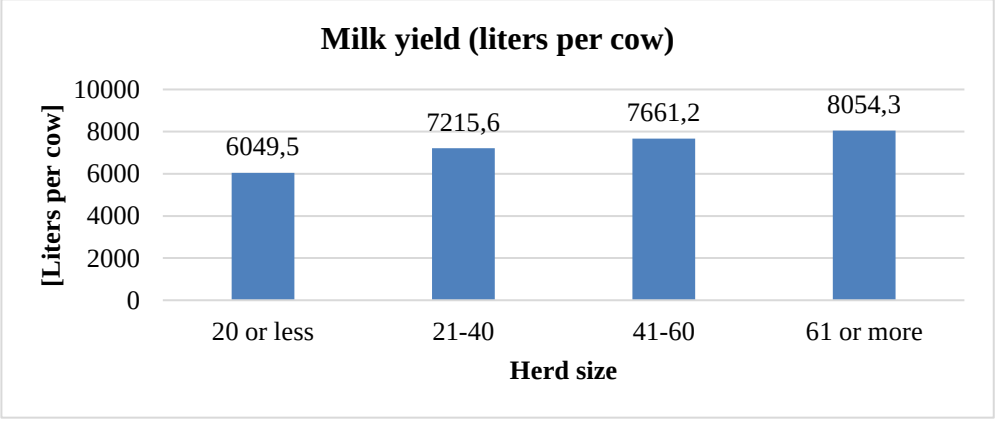

Figure 1. Milk yield from 1 cow

Source: own elaborations on the basis of surveyed farms

In 2015, milk quotas were ended, which increased competition in the dairy market, and consequently meant a reduction in milk purchase prices. As a result, farms with low production costs have the greatest chances of survival (Marzec and Pisulewski 2003).

It turns out that the variable cost incurred by dairy farmers depends on the prices of materials. On the other hand, the prices of feed and livestock are less important. Dairy farms in Poland are characterized by low-cost effectiveness. For an increase in efficiency, a large amount of work and time is necessary (Będzikowska 2015).

The dairy industry plays a huge role in the Polish economy in terms of social, environmental, and economic terms. It is one of the most important sectors of the food economy. It is an important element of the country's economic system due to the importance of milk in the commercial structure of agriculture, amounting to 19.4%. The demand for milk on the internal market is lower than the scale of its production. For this reason, a large part is intended for export. The production of milk is inextricably linked with the production of beef cattle. Farms that keep dairy cattle provide a significant proportion of the calves for fattening and cows for slaughter. Dairy farming also plays an important social role. This is because approximately 240 thousand farms live are in dairy, half of which also sell milk for dairy processing. This is an essential part of domestic food production, thanks to which approximately 33 thousand people are employed. Dairy cattle farming contributes to the expansion of biodiversity in agricultural production. This is due to the efficient use of grassland and increasing the demand for fodder from arable land. The generally understood natural environment benefits from this activity. Its conduct contributes to the occurrence of a by-product in the form of natural fertilizers. They are a valuable tool used to fertilize the soil and meet the objectives of sustainable agricultural production. Dairy farming also consumes a lot of water, which is related to the need to implement new technologies that consume less water. In recent years, the dairy sector has undergone major structural changes and modernization. They were related to processes aimed at meeting stricter hygienic conditions and adjusting the production and breeding of dairy cattle to the EU market regulations. The years 2017-18 saw an increase in the number of cows by 2,214 thousand head, and an increase in milk yield to 6,000 l./head.

The number of cows in the barns that are subjected to the milk performance inspection has increased. They constitute the "basis for the transmission of genetic progress" that serves the purpose of commodity production. In 2018, there were as many as 816 thousand head of the evaluated pieces, constituting 37% of the total and 8,150 kg./head in terms of milk yield (Kowalski and Kowalczyk, 2019).

9.4. Value of investments in dairy farm

The Common Agricultural Policy and the membership of Poland in the EU contribute to the development of agriculture, which is visible especially through the improvement technical equipment of farms. According to the research carried out in 2013-2014 by R. Rudnicki, 139.6 thousand projects were carried out, including applications with a total value of PLN 9.1 billion in connection with the processes of improving the technical condition of agriculture. At that time, farms were adjusted to the guidelines dictated by the EU, technical infrastructure was modernized (Rudnicki and Wiśniewski 2016).

The Rural Development Program for 2014-2020 was formed to apply European Union regulations. The regulations of the European Parliament and the EU Council of 2013 were mainly used. The aim of this program was to increase the level of competitiveness of agriculture, to use natural resources in a sustainable manner, and to develop rural areas in a sustainable manner.

One priority contained in the Program is to increase the profitability of farms, but also to popularize risk management in agriculture. An important goal is to protect ecosystems and give them strength, but also to popularize the development of farms in areas belonging to the village (https://www.gov.pl/web/rolnictwo/-program-rozkieta-obszarow - wiejskich-2014-2020- prow-2014-2020).

The program aims to improve the profitability of farms through investing in fixed assets, but also involvement in economic development and farm activities (Rural Development Program for 2014-2020).

Figure 2 shows the investments incurred for the purchase of machines and devices in the researched farms. The highest outlays are

incurred by farms with 60 or more cows. It is worth noting that these modern farms invest all their capital in the development of the farm.

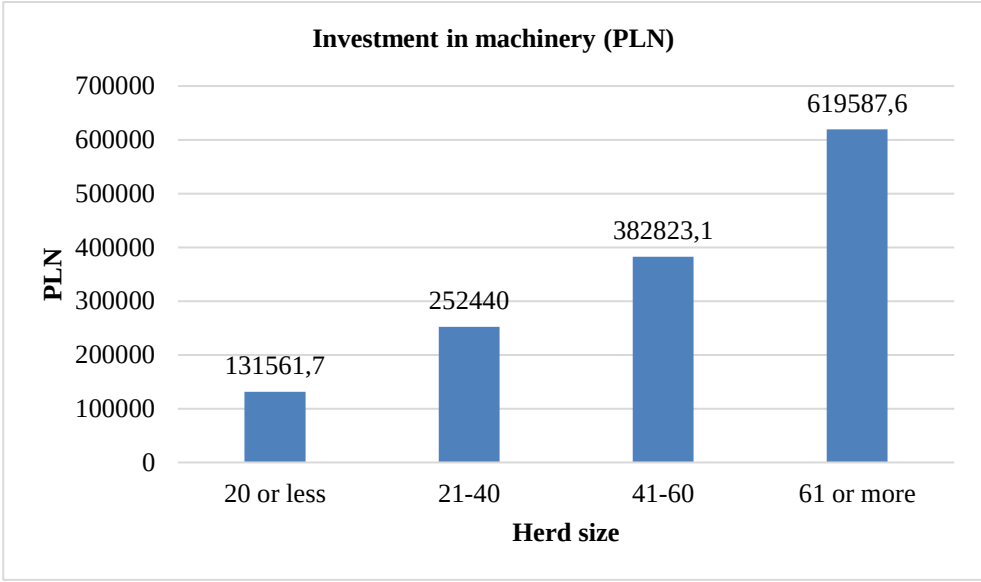

Figure 2. Value of investments for the purchase of machines
Source: own elaborations on the basis of surveyed farms

Data obtained from agricultural censuses of 2002 and 2010 were also used to analyze the development of farms with regard to their equipment with tractors, machines or other agricultural devices. As part of running a dairy farm, elements of agricultural mechanization are used: tractors, machines for harvesting grains and green fodder, collecting trailers and collecting presses, as well as general-purpose machines, e.g., cultivators, fertilizer spreaders, field tractor sprayers or mowers. tractor. In addition, dairy farms must be equipped with machines for animal production, such as tube milking machines and tank coolers (Rudnicki and Wiśniewski 2016).

One of the most basic agricultural machines is the tractor, which is the most frequently used equipment. Thanks to Poland's accession to the EU, many operational programs were introduced, which increased the possibilities of purchasing new agricultural machines. Since 2002, the number of brand new tractors has almost doubled. The years 2002-2010 saw an increase in the number of tractors in farms in Poland 101 thou.

pieces. At the same time, a decrease in the number of tractors was noticed in the following voivodeships: Opolskie, Dolnośląskie, Śląskie and Zachodniopomorskie. However, there were more tractors in the Podlaskie, Lubelskie, Warmińsko-Mazurskie and Mazowieckie voivodships (Rudnicki and Wiśniewski 2016). When it comes to machines used on livestock farms, in particular cows' rearing, we can mention pipeline milking machines and cooling tanks. It should be emphasized that the efficiency of milk production is influenced by the installation of modern milking equipment. According to the discussed analysis, until 2010 in our country there was an increase of 37 thousand machines for livestock production (Rudnicki and Wiśniewski 2016).

Devices intended for milking and storing milk are selected according to the housing system, herd size, milk yield of cows, and how often the milk is collected. Two systems of keeping dairy cows can be distinguished: stall and free stall. In the first animal, a separate stall is provided for feeding and resting, as well as for milking the cow. The free-standing system assumes feeding the cows in the corridor, which is called the forage area, and separate stalls or group stalls are used to rest. In addition, there are separate so-called milking parlors. The devices used for milking cows include: can milking machines and pipeline milking machines, which are intended for a tethered barn. The mechanism of the canister milking machine consists of collecting the milk in the can, after which it goes to the cooler, and the pipeline milking machine transports the milk through pipelines to the cooler. “Milking machines are characterized by low costs in terms of purchase, assembly and operation. However, they do require the transport of heavy bubbles to the cooler. Due to this fact, they are intended mainly for farms with up to 30 dairy cows. In turn, pipeline milking machines are less demanding, which are installed after minor changes to the barn. The solution for obtaining milk without having to milk the cows twice a day by the farmer are milking robots, the main advantage of which is milking automation. They contribute to the increase in milk yield of cows, as milking takes place several times a day. It can be used in an intensively fed herd (Muzalewski 2015). However, they are very expensive.

Figure 3 shows capital invested in farmland and grassland. The value of the land owned is PLN 244,304.8. Farms with 20 and fewer

cows have the least land. The estimated value invested in the land is 84 720.2 PLN.

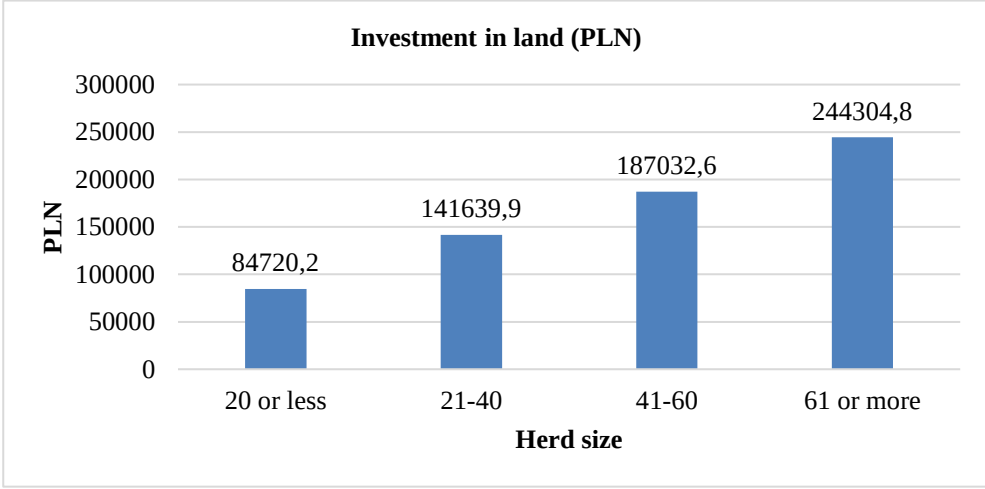

Figure 3. Capital invested in farmland and grassland
Source: own elaborations on the basis of surveyed farms

The buildings that must necessarily be equipped with a dairy farm are primarily cattle-breeding barns. For cattle breeding and milk production to be possible, the requirements for having large areas must be met. Dairy production and its infrastructure have constantly improved. If the buildings make it impossible to change the animal housing system, then they are modernized to at least ensure animal welfare as much as possible. Directly next to the building there must be a fenced area for livestock runs. It is necessary to ensure good sanitary conditions and a properly hardened and sewerage area. An important issue related to livestock buildings is the width of communication routes, as well as doors and gates, taking into account the dimensions of primarily animals. The rooms should be adequately lit with uniform lighting intensity. To ensure adequate weight gain and the expected milk yield of cows, windows are used, as well as lighting elements on the ceiling to obtain more natural light. Livestock buildings must have an efficient ventilation system that can provide well-designed natural ventilation. If it is insufficient, then it is necessary to install mechanical ventilation (Nowak 2013).

Figure 4 shows the money invested in the purchase of animals. The highest outlays for the purchase of animals are incurred by farms with

60 or more cows. They amount to 15 347.7 thousand PLN. The lowest amounts for the purchase of animals are on farms with 20 or fewer cows. They amount to approx. 2400 thousand PLN.

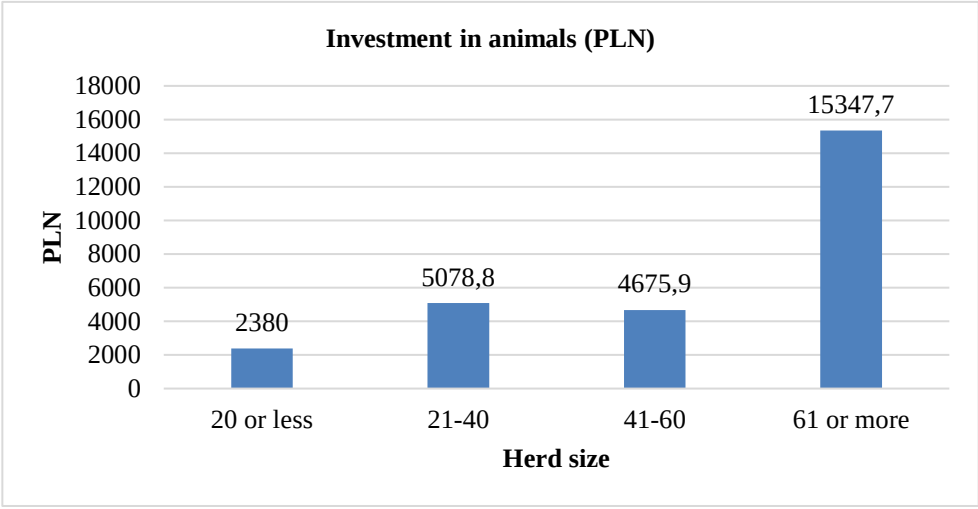

Figure 4. Money invested in the purchase of animals

Source: own elaborations on the basis of surveyed farms

In order for milk and dairy products suitable for consumption to be safely produced and, it is necessary to implement good practices by the producer. They also have an impact on ensuring an adequate economic and social level of dairy farms. Due to the activities of milk producers in the food production business, it is important that the quality and safety of milk are at the highest level. Therefore, good practices must meet the highest expectations of the food industry and consumers. They are a guarantee that the milk comes from healthy animals and in a manner that meets all appropriate standards (FAO 2011).

The main goal of good practices on dairy farms is "safe, high-quality milk obtained from healthy animals using practices that are appropriate from an animal welfare point of view, from a social perspective".

Good practice consists of the following elements: "animal health, milking hygiene, nutrition, animal welfare, the environment, and social and economic management." The basis of proper milk production is the health of animals and taking care of an effective system of their health protection. It is necessary to ensure proper hygienic conditions of devices and equipment intended for obtaining and storing milk. It is also

important to feed and water the animals, which must be safe and of adequate quality. Animal welfare is an equally important issue, i.e., compliance with the principles of the five freedoms, which are as follows: animals should be free from: "thirst, hunger and malnutrition, discomfort, suffering, trauma and disease, from fear, and to be free to behave normally "(FAO 2011).

Increased management efficiency may result in the allocation of financial resources to purchase new means of production. Obtaining a competitive advantage and maximum labor consumption is possible by providing the farm with sustainable means of production. Consumers force farmers to actively make investments due to their increased needs. Farmers have to protect the environment and constantly improve the conditions in which animals live. The opportunity to invest means the farmer must obtain capital. Farmers do not have easy access to loans, therefore they cannot make such large investments as they would wish (Kusz 2013).

Figure 5 shows subsidies to investments according to the size of the herd. The highest subsidies are granted to farms with 60 or more cows. They are at the level of 244304.8 thousand PLN. Farms keeping 20 or fewer cows receive the smallest subsidies. They amounted to 84 720.2 thousand PLN.

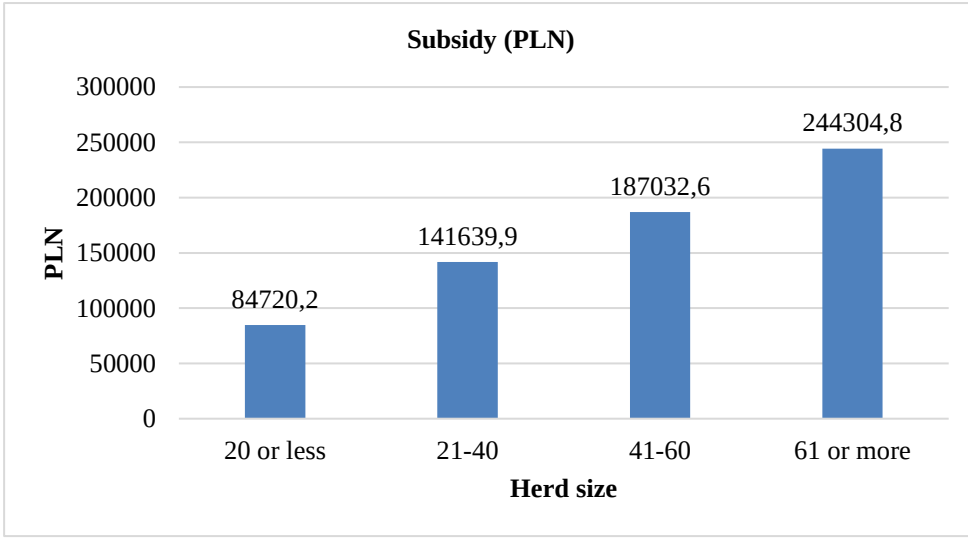

Figure 5. Subsidies to investments according to the size of the herd

Source: own elaborations on the basis of surveyed farms

There are many factors that play a role in changing processes on dairy farms, both present and future. One of the most important are political issues, which are usually complex, diverse, and subject to change. Additionally, milk production is influenced by national and international regulations. One of them is the so-called milk package valid until the end of 2020. According to its assumptions, the bargaining power of milk producers was to be strengthened by the introduction of collective bargaining for milk deliveries, for which binding formal contracts are made. In addition, a requirement has been introduced to send information related to the amount of purchased milk with a monthly distribution by purchasing entities to the state authorities, which will improve the transparency of milk production in Europe. According to Andrzej Parzonko, such solutions will only slightly stabilize the milk market in the EU (Parzonko 2013).

Taking a closer look at the dairy sector brings conclusions in the form of elaborating the needs of investment activities related to market interventions. In order to prevent a threat to the functioning of dairy farms, it is necessary, inter alia, to planning and organizing production in such a way as to be adapted to the demand, taking into account quality and quantity, achieving optimal production costs and stable prices. In addition, it is important that farms strengthen their bargaining position along the supply chain. The hosts must invest "in buildings and structures used in milk production: livestock buildings, milking equipment and robots, milk cooling tanks, devices for the preparation and distribution of fodder, warehouses and silos for fodder, agricultural machinery halls and chemical storage facilities for maintaining standards hygienic and veterinary as well as yield-generating agents". In addition, it is important to conduct investments related to innovative machines that are used to grow plants for the production of concentrated and bulky fodder. Such machines include: "cultivators, seeders, machines for the care of permanent grassland, harvesters, machines for cleaning and drying, and means of transport". In addition, an important issue is also investments in agricultural machinery, thanks to which the soil will be organically fertilized while increasing the level of humus, and investments in environmentally friendly machinery and equipment (Kowalski and Kowalczyk 2019).

9.5. Summary and conclusions

Investing in machinery, equipment and agricultural tractors enables the farmer to turn them around flexibly. Machines and tractors are movable elements of farm equipment, so in the event of financial problems, the farmer may receive at least a part of the invested money.

The conducted research shows that farmers with 60 and more cows make higher investment outlays. The research showed that farmers made changes in the supply of cattle to their farms. The changes also concerned the constructed buildings and the purchased machinery and equipment necessary for the rearing of dairy cattle.

Farm development depends on many factors. Opportunities, but also barriers appear in the form of aid programs addressed to farmers, but also in relations between the farmer and other entities with which cooperation in running a farm is necessary. The effect is the level of running the farm and the benefits achieved. The farmer cooperates with recipients for the sale of produce and suppliers of production means. In addition, farmers attach great importance to cost calculation to make their production profitable. The costs incurred must be proportionate to the expected profits. The help of an advisor may be helpful in this case. Farmers who want to develop their farms also use aid programs to improve their farms.

Not without significance are the problems that modern farmers have when they want to implement the started investments. Complex procedures and many months of investment implementation do not encourage farmers to spend their time on unprofitable activities. A modern farmer must show great self-denial in order to implement his investment plans.

The multiplicity of procedures necessary to apply in order to apply for EU funds requires knowledge of the law, but also persistence in striving to fulfill their own plans. All farmers indicated that the prices of fertilizers and feeds are high. Therefore, when running a farm and wanting to improve it, it is necessary to evaluate the benefits in relation to the costs incurred and to conduct close cooperation with many entities.

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