

FACTORS INFLUENCING THE DEVELOPMENT OF MILK PRODUCTION IN AGRICULTURAL HOLDINGS

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ABSTRACT

Many factors influence milk production and farm development. The most critical factor determining the production is the price of sold milk and indirectly the costs connected with its production. In majority of farms, milk production is profitable. The decisive factors influencing the profitability of milk production are the balance of nutrition and ensuring the welfare of dairy herds. Equally important are the genetic characteristics of cows and proper rearing of calves. The study shows that the modernization of farms also influences the development of milk production by improving the optimization of energy use and reducing labour intensity, and overall optimization of production costs.

Introduction

The Polish economy has been developing dynamically over the last twenty years. The economic development has not bypassed agriculture either. Agriculture has seen significant technological development, which is described by Litwińczuk et al. (2016). It is particularly noticeable in farms specializing in milk production. According to the Statistics Poland (GUS), the stock of cattle in Poland is still growing, and the number of dairy cows is not less than 90% (GUS-Head of cattle as of December, 2019). The dominant position is occupied by Podlaskie, Mazowieckie and Wielkopolskie Voivodeships (Bórawski and Zalewski, 2018). Milk, according to CSO data, in December last year cost an average of 1.40 PLN per litre and compared to November 2019 it was by 1% higher. The highest average price was recorded in Podlaskie Province. The high milk purchase price and its upward trend do not fully satisfy all producers, as indicated (Drozd, 2019). Dissatisfaction of the Polish producers

results from the relation of the obtained profit to production costs in comparison to Western Europe. Milk producers, striving to improve the economic efficiency of production, take actions aimed at increasing cow productivity and reducing unit costs by increasing production (Włodarczyk and Budvytis, 2011).

Animal production and especially dairy farming is a very labour-intensive production department. Reducing labour intensity by modern technologies and tools allows for significant improvement in the economics of milk production and thus improves farm profitability (Wójcik, 2013). Modern technologies facilitate everyday work on the farm, which positively influences the development of milk production (Rodriguez et al., 2018). Large and strong dairy cooperatives pay more for the raw material than their weaker competitors. This puts individual milk producers in a different position (Sowulska-Skrzyńska et al., 2012). However, most farmers are motivated by the fact that greater milk production brings greater profits (Baer-Nawrocka and Kiryluk-Dryjska, 2010).

The costs of produced milk include, among other things, feed, veterinary services, and reproduction costs, as well as energy, fuel, and machine costs. Moreover, most importantly, human work, without which everything else cannot function (Skarżyńska, 2011). There is a wide range of factors shaping milk yield. Particularly noteworthy are genetic (racial, individual, inheritance) and environmental (e.g. nutrition, living conditions, climatic conditions) factors. Genetic factors are assigned 30% of the influence, and the remaining 70% are assigned to non-genetic factors. Moreover, these factors are closely related to and influence each other (Wilkanowska, 2017).

Increasing the efficiency of milk production does not always improve animal welfare. In many cases, the high production results obtained are paid for by a high price, associated with the increase in the cost of veterinary treatments, or the accelerated lack of animals (Chmielewski, 2018).

Factors influencing the quantity and quality of milk produced are:

- type and amount of feed,
- feed quality,
- concentrated feed to volume ratio,
- balancing the food ration,
- nutrition technology,
- access to clean and freshwater.

For an optimal course of lactation, a well-balanced diet providing protein and energy is essential. Energy deficiency in the dose results in a decrease in productivity, which lasts for a certain period after the deficiency is removed (Wilkanowska, 2017). Dietary mistakes can adversely affect cow health and reduce milk production. An ill-balanced ration that is not adjusted to the current physiological state and season can have a significant impact on milk production (Tumanowicz, 2018). A common reason for administering the wrong amount of feed is the lack of weight, with which fodder carts are equipped. Administration of roughage "from a trailer", without weighing it, additionally introduces an element of variability between consecutive days, which negatively affects the rumen (Sowińska and Lubiński 2018). Diseases result from the fact that the needs of cows (increasingly more in terms of genetic potential) are not compatible with the skills and economic capabilities of breeders (Smulski, 2019). Metabolic diseases can significantly reduce the quality and quantity of milk produced (Lacasse et al., 2018).

Regardless of precisely balanced nutrition, the right amount of water is required to achieve optimum performance. Access to fresh and clean water is a priority for cows to produce the optimal amount of milk. At peak lactation, cows drink about 100-120 litres·day⁻¹ (Nardone et al., 2010).

Material and Methods

This work aimed at examining the most essential elements that influence the development of milk production in family farms. To show what factors influence the development of milk production, a survey was conducted among 50 farms located in Podlaskie Province. In the area of this province, dairy cattle breeding dominates. The research was conducted in the period from February to April 2020 using a questionnaire form. The questionnaire included questions about, among other things, the most important factors influencing effective production, evaluation of milk production, factors influencing the amount of the obtained product, planned development and adaptation of farms to the conducted production. The survey was conducted among the customers of an authorized DeLaval dealer. The chosen company has been on the market for over 25 years. The company offers modern equipment to facilitate cow husbandry and milking. The range of products offered by the store has been designed to help predict that its customers will be dairy farmers. The survey was conducted in paper form. The people who filled in the questionnaire were dairy farmers who visited the store and agreed to it. The farmers surveyed were from Lomza district and neighbouring districts. Cow's milk production dominates in this area. In terms of milk purchase, Podlaskie Voivodeship is on the first place in the country and grasslands constitute about 20% of the whole country. The survey consisted of 14 single-choice questions and one multiple-choice question

Results and Discussion

The overwhelming majority of farmers aged 31-40 years took part in the study. This group constituted 52% of the respondents. The 41-50 age group accounted for 36% of the respondents. There were no farmers over 60 years old in the study group. This shows that farmers of advanced age handed over their farms to young successors. In the surveyed group men constituted 76%, women 24%.

In the survey respondents were asked about their education. The largest group of respondents have higher education related to agriculture. Such an answer was provided by 20 respondents, which constitutes 40% of the surveyed group. Higher education, not related to agriculture, was declared by 28% (14 persons) of the respondents. In total, the respondents with higher education constituted 68% of the surveyed. The situation is similar in the group of respondents declaring secondary education. In this group, 20% (10 respondents) have secondary education related to agriculture, and 12% of respondents have other secondary education not related to agriculture. The above data shows that most people who took part in the survey, i.e. 60%, have an agricultural background (higher and secondary agricultural).

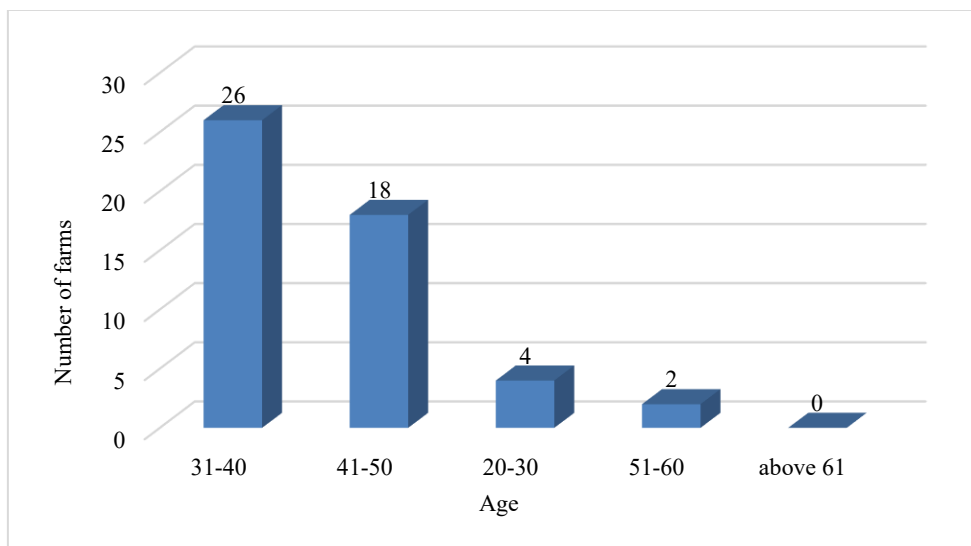


Figure 1. Age structure of respondents. (Own elaboration based on research)

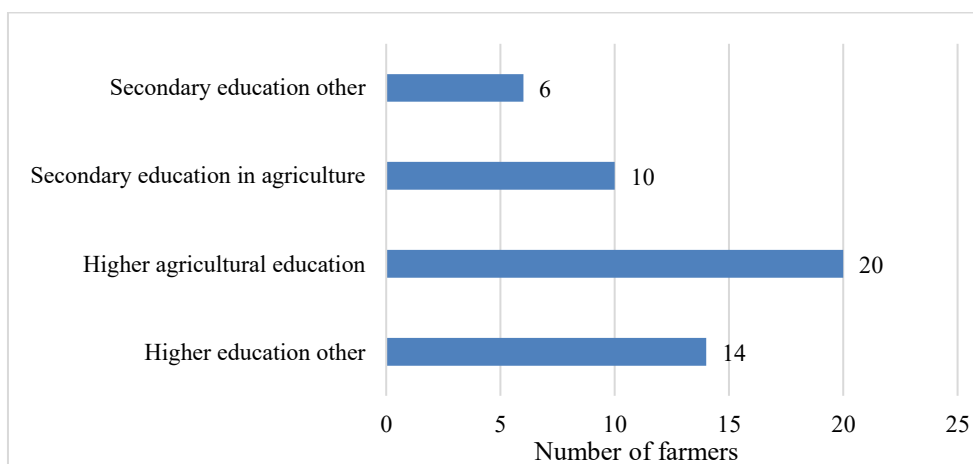


Figure 2. Education level of respondents. (Own elaboration based on research)

In dairy cow breeding, an essential element is the proper feeding and ensuring the right amount of balanced feed. Proper nutrition depends largely on the appropriate amount, and quality of the roughage obtained. The right amount of roughage depends, among other things, on the area of cultivated land. The survey includes a question about the area of the farm used. Based on the survey, it was found that farms with an area of more than 51 ha constituted 60% of all surveyed farms. This confirms the observed tendency to increase the area of family farms.

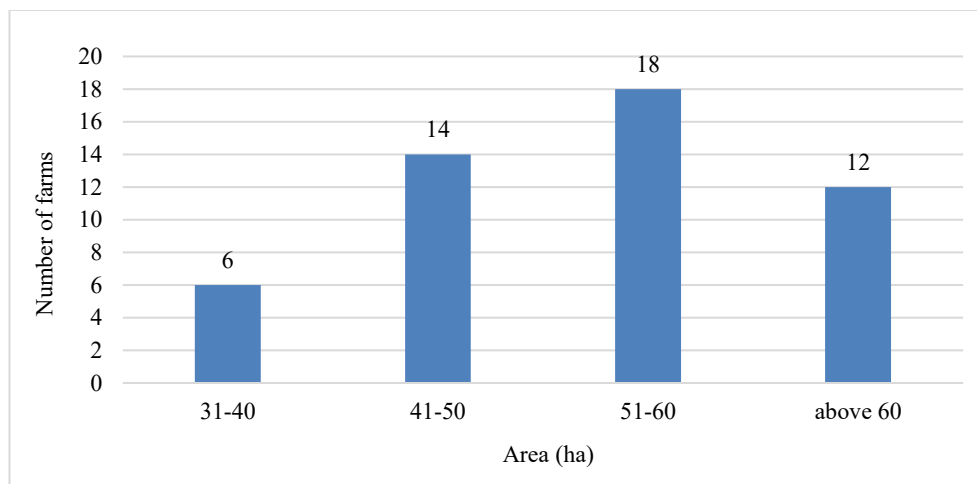


Figure 2. Area of surveyed farms. (Own elaboration based on the research)

The area of the farm, the ability to produce the right amount of good quality fodder is directly related to the size of the herd of cows. Farmers often make up the shortage of roughage by purchasing it. Lack of possibility to use feed from own production affects the profitability of milk production by increasing costs. Therefore, farmers often adjust the size of their herd to their land area. According to the data obtained in the study, 20% (10 farms) have herds from 31 to 45 milk tiers. In the range of 46-60 cows, 24% of the examined population declared more massive herds, in the range of 61-75 cows 36% - 18 farms. The largest herds of 76 cows and more declared 20% of the examined population.

The relationship between the size of farms and the number of dairy cows in the herds is confirmed by the data collected. Farms with arable land over 40 ha were declared by 88% (44) of the surveyed farms. Herds of over 46 are used by a total of 40 farms, which constitutes 80% of the surveyed. These values confirm the relationship between the farm size and herd size.

In the conducted survey, the respondents declared the average annual yield in the herd. According to the data, the range of yields ranged from 6000 kg of milk·year⁻¹ to over 11 000 kg of milk·year⁻¹. In the surveyed farms, the average yield between 8 000 and 9 000 kg of milk·year⁻¹ was declared by 20% of farmers. The largest group of the surveyed were the farmers declaring the average annual yield in the range of 9 001-10 000 kilograms of milk·year⁻¹. Such productivity was declared by 36% of the surveyed. A high and very high yield in a herd, i.e. more than 10 000 kilograms of milk·year⁻¹ was declared by 44% of the respondents. It proves the high level of average yield in the examined farms.

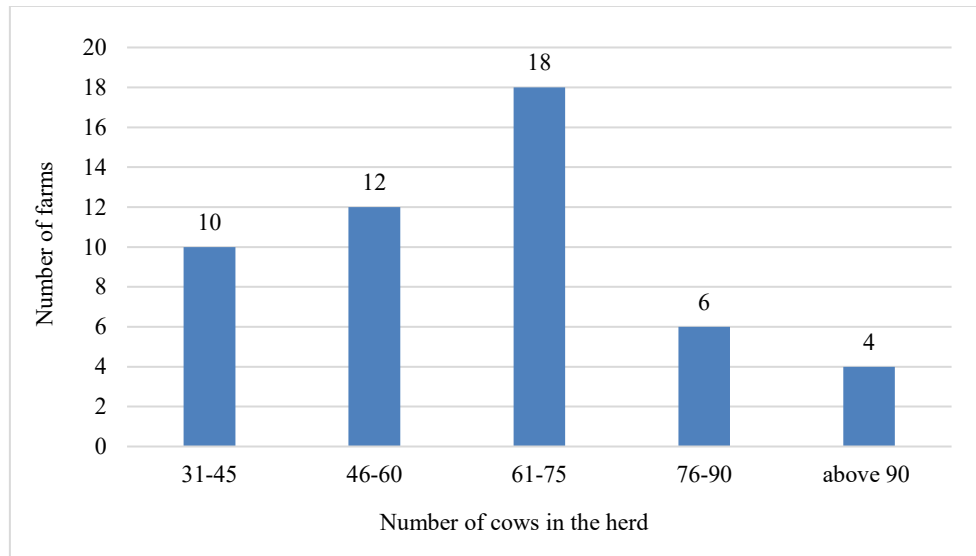


Figure 4. Number of dairy cows in the tested herds. (Own elaboration based on research)

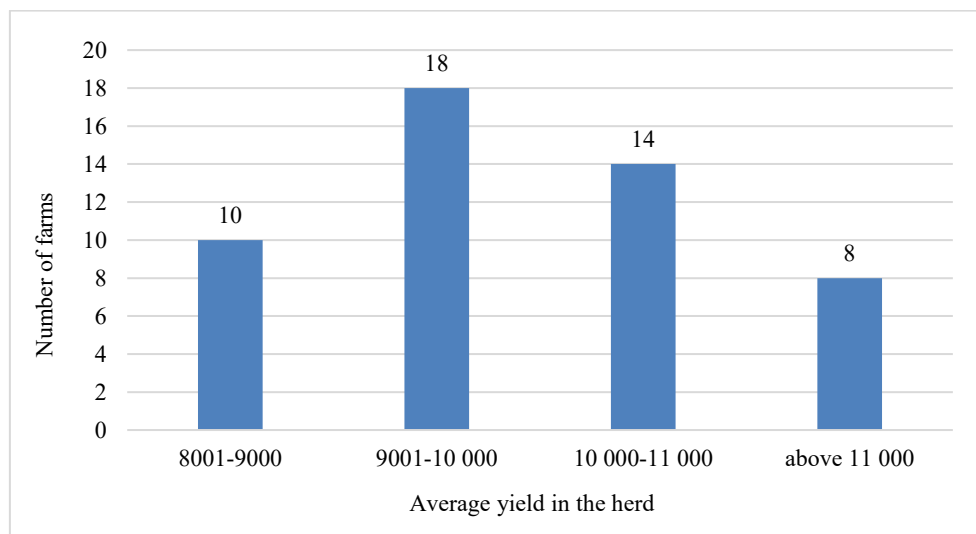


Figure 5. Declared yield per cow in lactation, in the tested herds, in kilograms of milk-year⁻¹

Factors influencing the development...

Many factors influence the high average annual yield found in the studied flocks. One of them is the level of use of modern means of production and application of new technologies in cow's milk production. This level is defined as the degree of farm adaptation and indicates the technical and organizational means used in farms in the process of milk production. In the conducted survey, the respondents determined the degree of adaptation of their farms. Most of the respondents, i.e. 56%, said that "they are partly modernized and thus make my daily work easier" and 28% of the respondents described this adaptation as "fully mechanized, which reduces the workload". The rest of the respondents plan to modernize their farms in the future. This shows that most farms are adapted to milk production, and the efficiency of production has increased.

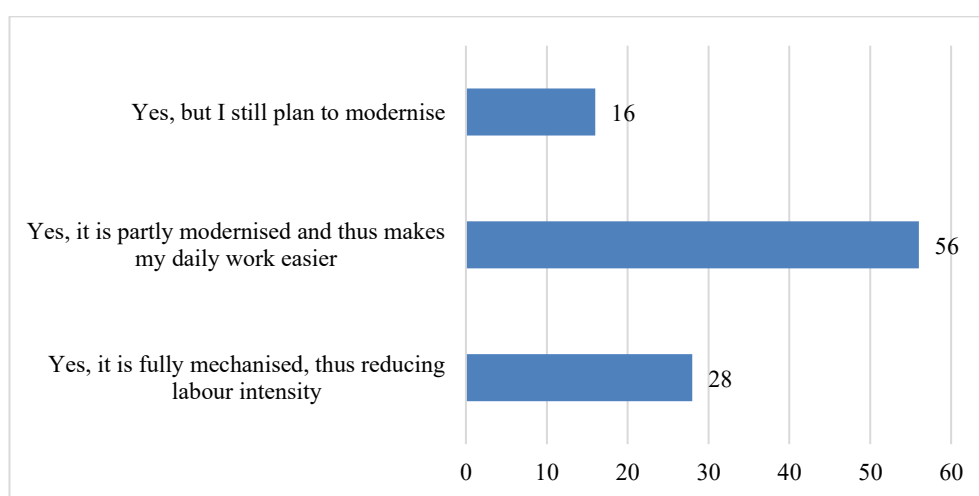


Figure 6. Degree of adaptation of farms to milk production (in %). (Own elaboration based on research)

In the study, farmers evaluated the profitability of milk production. It was a subjective evaluation of the profitability of production in their farms. The respondents, i.e. (68%), estimated that cow's milk production is profitable. Moreover, they declared that they would strive to increase production, defining it as their primary goal – 28% of the respondents and taking action to increase production and income – 40% of the respondents. A group of 32% of the respondents indicated that they would not strive to increase production because the current level of production is sufficient. The profitability of milk production declared by the respondents makes them plan to develop their farms in the future. However, it should be noted that 16 answers suggest that they do not want to develop their farms in the future. This is due to continually rising production costs with no increase in milk prices.

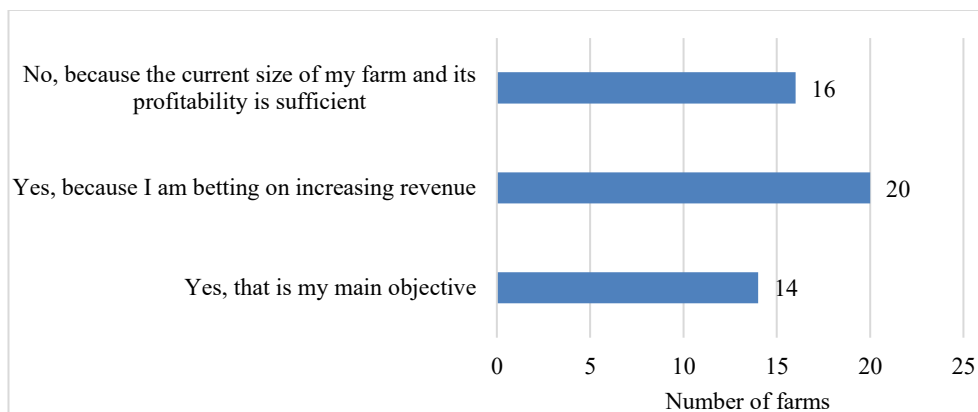


Figure 7. Determination of profitability of production. (Own elaboration based on research)

The respondents also pointed out the main threats to the development of milk production. According to the respondents, these are weather conditions, high production costs and low price of milk collection. Weather conditions were indicated by most of the respondents, which is 36%. The remaining two factors were indicated by 24% of the respondents, i.e. 48% in total. It results from the above data that economic factors, to a huge extent influence farmers' decision on increasing milk production. The respondents did not point out that the following are a threat:

- low herd milk yield,
- limited livestock conditions,
- insufficient farm mechanization.

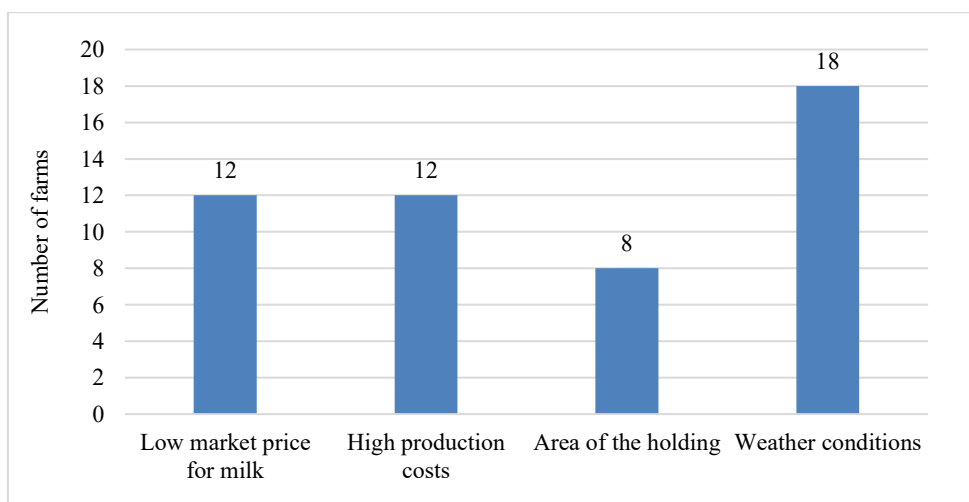


Figure 8. Factors limiting the increase in milk production. (Own elaboration based on research)

Factors influencing the development...

The milk producers who took part in the study also identified circumstances which, in their opinion, have a positive impact on the production growth. According to the respondents, the most critical factor determining the increase in production is the milk purchase price. This was indicated by 40% of respondents. The collected data indicate that the reasons which also influence the development of production are: the herd size, which was indicated by 16% of the respondents and the degree of adaptation of the farm to production, which was also indicated by 16% of the respondents. Not without significance are herd productivity, the profitability of production and abolition of milk quotas. The reasons related to herd efficiency and profitability of production were indicated by 6% of respondents each. The least important for the increase in production was the abolition of milk quotas, only 4% of indications.

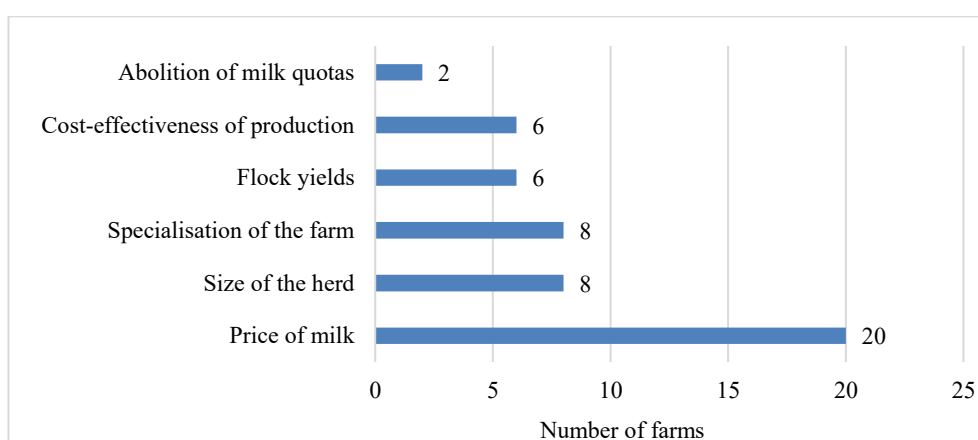


Figure 3. Factors affecting increased milk production. (Own elaboration based on research)

The respondents named factors that affect the milk production efficiency. The study showed that the most important factor influencing the milk production efficiency is proper feeding of cows. This factor was indicated by 26% of respondents. The next factor indicated was health and reproduction – 22%. Slightly lower results were achieved by optimization of productivity – 18% and welfare – 16%. The factor which has the least influence on the production efficiency is, according to the respondents, the modernization degree. This factor was indicated by only 5% of the respondents.

Working on farms requires great dedication, labour, and responsibility. There are many factors to make milk production profitable and develop. According to Ziętara (2012) the basic factor of production is human labour, for which farmers are paid. Farmers' profitability depends on farm income, which in turn depends on the price of the raw material sold. The level of profits, in addition to the scale of production, is determined by the relationship between the prices of agricultural products sold by farmers and the cost of purchasing the means of production (palms, feed fertilisers, etc.). The relationship between the prices of production factors and the prices of agricultural products sold shows different growth rates.

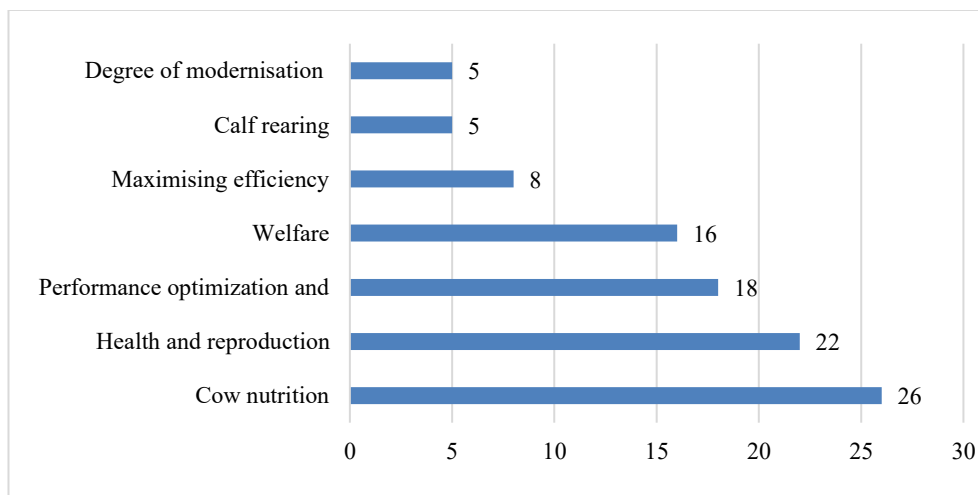


Figure 10. Factors influencing milk production efficiency (in %). (Own elaboration based on research)

Based on an analysis of the costs associated with milk production and farm profitability, their level of profitability can be determined. With the current trend of rising costs, for smaller farms, production may be unprofitable (Wilczyński, 2009). Therefore, not all farms specialising in milk production will be able to function effectively. To make production profitable, farmers are increasing the scale of production, by increasing their herd size and ensuring animal welfare, which contributes to the quantity of milk produced. This is confirmed by the farm owners participating in the study, who believe that the price of milk sold is currently too low in relation to production costs. According to those surveyed, such dependence on-farm operation has an impact on the development of production.

Daily duties are carried out even by several family members if the farm is not fully modernised and mechanised. Following the technological progress, production can develop, and the daily tasks performed will be more comfortable and less labour-intensive, which is confirmed by the research. According to the respondents, appropriate and balanced nutrition is the most critical factor determining the profitability of production, which is confirmed by Skarżyńska (2012) in her research.

According to Parzonko (2012), in order for the development of dairy farms in Poland to take place, activities must be carried out that will recognise the specificity of milk production (high capital and labour-intensive production). Targeted measures (structural funds or long-term low-interest loans) should be directed towards the construction or modernisation of livestock buildings, contributing to the increase of the production scale, and reducing labour intensity. Studies have shown that running a farm requires costs to be incurred for production to be efficient and profitable. Farmers participating in the study have modernised farms or plan to modernise them and at the same time confirm that appropriate mechanisation of processes facilitates their daily work and affects the quantity and quality of production. However, the modernisation of farms requires a significant financial contribution, which can be

partly financed from EU funds. Such factors influence the willingness to develop production, which is an objective of the farmers concerned.

Conclusions

On farms producing cow's milk, the most important aspects of influencing production are economic factors. The price of milk purchase determines the actions of farmers in maintaining and developing milk production. Milk production is profitable, but the costs of production and herd maintenance are continually increasing. Regardless of economic factors, which stimulate conditions of milk production, factors which are a threat were indicated.

The most crucial factor indicated in the study is atmospheric conditions. They directly influence the quality and quantity of prepared roughage on the farm. It significantly reduces production costs.

The average productivity of the tested herds is within the range from 9 000 to 10 000 kg of milk·year⁻¹. The high declared average productivity of herds is not related to the degree of modernization of farms. It is related to the fact that most of the farms have already achieved a high degree of mechanization sufficient to achieve high productivity.

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CZYNNIKI WPŁYWAJĄCE NA ROZWÓJ PRODUKCJI MLEKA W GOSPODARSTWACH ROLNYCH

Streszczenie. Wiele czynników wpływa na produkcję mleka i rozwój w gospodarstwach rolnych. Najważniejszym czynnikiem wpływającym na produkcję jest cena sprzedawanego mleka a pośrednio koszty związane z jego produkcją. W zdecydowanej większości gospodarstw produkcja mleka jest opłacalna. Decydującymi czynnikami wpływającymi na opłacalność produkcji mleka jest zbilansowanie żywienia i zapewnienie dobrostanu stad krów mlecznych. Równie ważne są cechy genetyczne krów i właściwy odchow cieląt. Przeprowadzone badanie wykazuje że wpływ na rozwój produkcji mleka mają również modernizowanie gospodarstw poprawiająca optymalizację wykorzystania nakładów energetycznych oraz zmniejszająca pracochłonność a w dłuższej perspektywie optymalizację kosztów produkcji.

Słowa kluczowe: produkcja mleka, żywienie zwierząt, dobrostan, dochodowość, nowoczesne technologie