

Characteristics and problems of dairy cattle farms in Bulgaria

Tsvetana Harizanova-Metodieva^{1*}, Maya Ignatova¹ and Tatiana Ivanova²

¹*Agricultural Academy, Institute of Animal Science, 2232 Kostinbrod*

²*Agricultural Academy, Agricultural Institute, 9700 Shumen*

*Corresponding author: ts_harizanova@abv.bg

Abstract

Harizanova-Metodieva, Ts., Ignatova, M. and Ivanova, T. (2019). Characteristics and problems of dairy cattle farms in Bulgaria. *Bulgarian Journal of Agricultural Science*, 25(5), 903–908

The aim of the research was to classify dairy cattle farms, regarding their specific characteristics, as well as to study the main problems associated with their activity. The following indicators of 17 dairy cattle farms were studied: age, gender and farmers' education, number of cows in the main herd, average milk yield, milking equipment, buildings, number of lactations, cleanliness in the farms, cull rate, age of inclusion of cows in the main herd and calf fattening duration. A cluster analysis was applied, based on which the farms were classified into 2 clusters – the first included 6 farms and the second one – 11 farms.

As a result of the research, it was found that in both groups of farms the cows' number in the main herd and milk yield were above the average value for the country. The central point of the first cluster was characterized as a farm with 144 cows in the main herd with an average milk yield of 5917 liters. Cows were included in the main herd at the age of 27 months and stayed there for an average of 5 lactations. The central point of the second cluster described a farm with 210 cows in a main herd and 7305 liters average milk yield. Cows were included in the main herd at 24 months of age, and were used for an average of 5 lactations.

It was found that the most prominent problems for the farmers were the insufficient access to credits, high raw material prices, low purchase prices, difficulties in selling the production, leaving staff, difficulties in finding suitable staff, difficulties in providing veterinary services. The farmers had obstacles in finding veterinary, financial-accounting, selection and market information, as well as information on feeding and animal keeping. As sources of information, the farmers indicated: veterinarian, accountant, Agricultural Advisory Service, consultants, professional organizations, sales representatives, and internet.

Key words: cattle farms; milk yield; cluster analysis; Bulgaria

Introduction

Dairy cattle sector plays indispensable role for supplying the world population with milk and dairy products. In 2017 in Bulgaria were produced 968 177 tons of cow milk, or 89% of the total dairy production, from a total of 252 thousand dairy cows (MAFF, 2017).

Regarding the number of farms in the sector, the following trends were observed during 2002 – 2017 (MAFF, 2002; MAFF, 2017):

- The total number of dairy farms had decreased 7.6 times in 2017 compared to 2002 (from 183234 in 2002 to 24142 in 2017).
- Farms from 1 to 2 dairy cows were gradually decreasing: from 162141 in 2002 to 16059 in 2017 or the number of these farms had decreased 10 times in 2017 compared to 2002;
- Farms from 3 to 9 cows had decreased from 17624 in 2002 to 2987 in 2017, or nearly 6 times;
- Farms from 10 to 19 dairy cows had decreased from 2052 in 2002 to 1740 in 2017, or 1.2 times;

• Farms with more than 20 cows had increased from 1417 in 2002 to 3356 in 2017, or their number increased 2.4 times during the period.

By 1 November 2017, the cattle number in Bulgaria fell off with 22% compared to 2002; the number of dairy cows declined by almost 30% over the same period, but the cow milk production increased by 7.72% (MAFF, 2002; MAFF, 2017). The increased production of cow milk is mainly due to the increase in the average milk yield of dairy cows.

So in Bulgaria the dairy farms with up to 20 dairy cows are still prevailing, although there is a tendency for increasing average herd size (Doitchinova et al., 2017), as well as average milk yield.

In a survey, held in Bulgaria, (Harizanova, 2010) is claimed that small – scale farms are characterized with low efficiency and the selling of production does not bring decent income for the farmers. According to Stankov (2015) small dairy cattle farms have lower rate of return compared to medium and large scale farms. But in the same time small – scale farms are important for rural areas (Dirimanova, 2018).

The problems and challenges in front of the dairy sector vary across the world, but mainly they encompass lack of funds and education, management, marketing and social problems, animal health and reproduction issues (Hahlani and Garwi, 2014; Guadu and Abewaw, 2016).

The aim of the research was to classify dairy cattle farms, regarding their specific characteristics, as well as to study the main problems associated with their activity.

Material and Method

Characteristics of farms

The following indicators of 17 dairy cattle farms, situated in Northern Bulgaria, were studied: age, education and gender of the farmers, number of cows in the main herd, average milk yield, milking equipment, buildings, number of lactations, cleanliness in the farms, cull rate, age of inclusion of cows in the main herd and calf fattening duration. The data was collected during the period 2016 – 2018 through a questionnaire.

A K-Means Clustering was applied, based on which the farms were classified into 2 clusters: the first cluster included 6 farms and the second one – 11 farms. The weight of each studied indicator in terms of cluster formation was studied with one – way analysis of variance. The distance between the clusters' centers and between the farms inside the clusters was determined by the Euclidean distance. The cluster analysis is used both in agriculture as a whole (Tiwari and Misra, 2011, Usai et al., 2006), as well as in dairy cattle breeding (Ravagnolo and Misztal, 2002; Alvarez et al., 2008; Bramley et al., 2008).

When analyzing the collected data, it was found that from

two of the farms, information about the percentage of cull cows was not received; there was no information for one of the farms about the age of inclusion of cows in the main herd. To address the problem, missing values analysis (Pigott, 2001) was applied.

Problems of dairy cattle farms

From 7 of total 17 studied cattle farms, information about the main problems connected with their activity was gathered. Problems were rated by farmers on the scale from 1 to 3 (1 – the problem can not be overcome, 2 – can be overcome in a difficult way, 3 – can easily be overcome).

These 7 farmers had also responded from where they obtained the information they needed to carry out their activity. The degree of difficulty in obtaining the information had also been evaluated by farmers on the scale from 1 to 3 (1 – difficult; 2 – relatively easy; 3 – very easy).

The average scores of the problems were calculated as an arithmetic mean (it was summed the scores the farmers gave to each problem, then the sum was divided by the number of farmers who indicated that problem). The average scores of the degree of difficulty in obtaining information were calculated in the same way as the average scores of the problems.

Results and Discussion

Characteristics of farms

The average milk yield in the researched farms ranged from 5000 to 8000 liters. Regarding the cows' number in the main herd, the farms were divided into: 4 farms with up to 50 cows in the main herd; 6 from 51 to 100 cows; 2 from 101 to 200 cows and 5 with more than 200 cows.

The research found out that 10 (59%) of the farmers had higher education and 7 (41%) had secondary education. In terms of age, the farmers were divided as followed: 10 (59%) were between 40 and 50 years of age; 5 (29%) were aged between 51 and 65 and 2 (12%) were from 66 years and older (Figure 1). It was found out that 16 of the farmers were men.

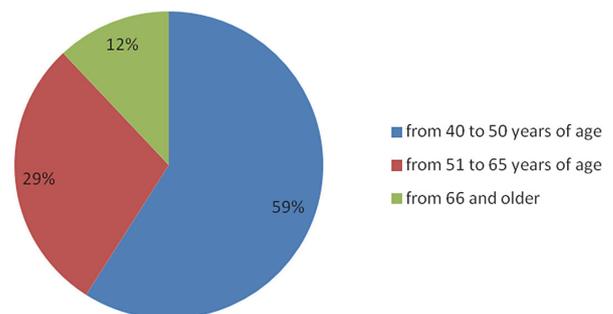


Fig. 1. Farmers' age

Source: own calculations

Table 1. One –way analysis of variance of the data

Indicator	F-statistics (probability)
Gender of the farmers	0.529 (0.478)
Farmers' education	2.571 (0.130)
Farmers' age	4.03 (0.063)
Cow number	0.377 (0.548)
Average milk yield (liters)	26.328 (0.000)
Milking equipment	1.176 (0.295)
Buildings	0.669 (0.426)
Number of lactations	0.047 (0.831)
Cleanliness in the farms	2.545 (0.131)
Cull (%)	0.672 (0.425)
Age of inclusion of cows in the main herd (months)	10.45 (0.006)
Calf fattening duration (months)	2.667 (0.123)

Source: own calculations

In order to classify the farms on the basis of their specific characteristics, a cluster analysis had been applied. It was found that the clusters were mainly formed by the average milk yield and the age (in months) of inclusion in the main herd (Table 1). With less weight was the age of the farmers. The other indicators had the least influence on cluster formation (farmers' gender and education, cows' number, milking equipment, buildings, number of lactations, farms' cleanliness, cull rate and calf fattening duration).

Table 2 listed the central points of the two groups (clusters). The central points showed the characteristics of the two farms' clusters.

The central point of the first cluster had the following characteristics: the farmer was a man with secondary education, aged 56; farm buildings had been renovated; 144 dairy cows with an average milk yield of 5917 liters were raised; cows were used an average of 5 lactations; milk pipeline was

used; some flaws in the cleanliness were observed; cull rate – 18%; age of inclusion of cows in the main herd – 27 months; calf fattening duration – 14 months.

The central point of the second cluster was characterized as followed: the farmer was a man with higher education and 49 years of age; farm buildings had been renovated; 210 dairy cows with an average milk yield of 7305 liters were bred; cows were used an average of 5 lactations; milk pipeline was used; some flaws in the cleanliness were observed; cull rate – 20%; age of inclusion in the main herd of the cows – 24 months; calf fattening duration – 8 months.

The Euclidean distance between the central points of the two clusters was 1389.50.

Figure 2 and Figure 3 showed the farms' distances to the center of the respective cluster to which they

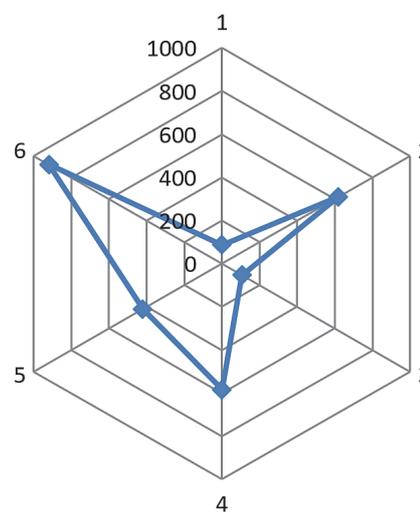


Fig. 2. First dairy farm cluster

Source: own calculations

Table 2. Centers of the two dairy farm clusters

Indicator	First cluster	Second cluster
Gender of the farmers	Male	Male
Farmers' education	Secondary education	Higher education
Farmers' age	56	49
Cow number	144	210
Average milk yield (liters)	5917	7305
Milking equipment	Milk pipeline	Milk pipeline
Buildings	Renovated	Renovated
Number of lactations	5	5
Cleanliness in the farms	Some flaws	Some flaws
Cull (%)	18	20
Age of inclusion of cows in the main herd (months)	27	24
Calf fattening duration (months)	14	8

Source: own calculations

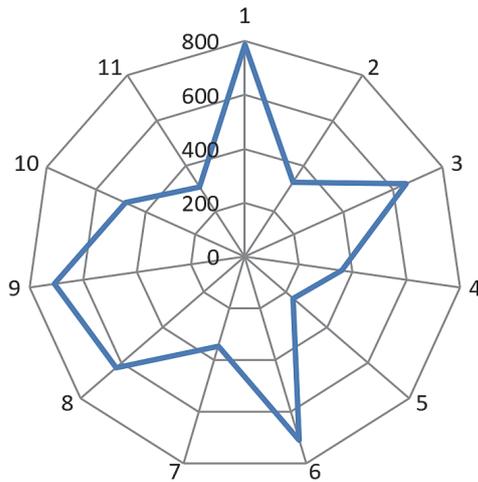


Fig. 3. Second dairy farm cluster

Source: own calculations

belonged. In the first cluster the distances ranged from 86.99 to 918.56 and in the second cluster from 235.46 to 786.10.

By comparing the characteristics of the two central points we concluded that in the second cluster the farmer was younger with higher education, than the first cluster where the farmer was older and with secondary education. In the second cluster, more dairy cows were kept with higher milk yield. The animals in the second cluster were included earlier in the main herd, with higher cull rate than the first cluster. In clusters the cows were used an average of 5 lactations, some flaws in the cleanliness in the farms were observed, the buildings were renovated and the cows were milked with a milk pipeline.

Problems of dairy cattle farms

The study found (Table 3) that the main problems faced by farmers were:

- Insufficient access to credits – 7 farmers had indicated this problem, which could be overcome in a difficult way (average score 2).

- High prices of raw materials; low purchase price of the production; difficulties in selling the production; leaving staff; difficulties in finding suitable staff – 6 farmers had identified these problems, which according to the study could be overcome in a difficult way (average score 2).

- Compliance with hygiene requirements for milk production; difficulties in providing feed for animals – 3 farmers had identified those problems that could be difficult to overcome (average score 2) according to the study results.

- Difficulties in complying with animal welfare requirements – 3 farmers had identified it as a problem that could be easily overcome (average score 3).

- Difficulties in providing veterinary services – 5 farmers had indicated it as a problem that could be overcome in a difficult way (average score 2).

- Difficulties in obtaining accounting services; difficulties in obtaining quality semen – 2 farmers had identified those problems that could be easily overcome (average score 3).

From Table 3 we can conclude that for farmers the most prominent problems were insufficient access to credits, high raw material prices, low purchase price, difficulties in selling the production, leaving staff, difficulties in finding suitable staff, difficulties in providing veterinary services. To a lesser extent, as problems occurred: compli-

Table 3. Main problems of the farmers

Indicator	Number of farmers reporting the problem	Average score
Insufficient access to credits	7	2
High prices of raw materials	6	2
Low purchase price of the production	6	2
Difficulties in selling the production	6	2
Leaving staff	6	2
Difficulties in finding suitable staff	6	2
Compliance with hygiene requirements for milk production	3	2
Difficulties in complying with animal welfare requirements	3	3
Difficulties in obtaining quality semen	2	3
Difficulties in providing veterinary services	5	2
Difficulties in obtaining accounting services	2	3
Difficulties in providing feed for animals	3	2

Source: own calculations

Table 4. Types of information needed by farmers and the degree of difficulty in obtaining it

Indicator	Number of farmers indicating this type of information	Average score
Financial and accounting information, including taxes and social securities	5	2
Veterinary information	6	2
Selection information	6	2
Information on feeding and animal keeping	4	2
Information on hygiene requirements, storage and production of quality products	4	3
Market information (output prices, suppliers, customers and other contractors)	6	2
Information on modern technologies – milking, cleaning, buildings	4	3
Other information	2	3

Source: own calculations

ance with hygiene requirements for milk production; difficulties in complying with animal welfare requirements; difficulties in obtaining quality semen; difficulties in obtaining accounting services; difficulties in providing feed for animals.

Table 4 presented the types of information needed by farmers to carry out their activity and the degree of difficulty in obtaining it.

The data in Table 4 show that for the farmers, it was the most difficult to find veterinary, financial and accounting, marketing and selection information, as well as information on feeding and animal keeping. Relatively easy they found information on hygiene requirements, storage and production of quality products, information on modern technologies and other information.

As sources of information, farmers indicated: veterinarian, accountant, Agricultural Advisory Service, consultants, professional organizations, sales representatives, and internet.

Conclusion

As a result of this research, it was found that in both clusters the number of cows in the main herd and milk yield were above the average for Bulgaria.

The central point of the first cluster was characterized as a farm with 144 cows in the main herd and with 5917 liters average milk yield. Cows were included in the main herd at the age of 27 months and were used 5 lactations as average. Annually 18% of cows were culled. The farmer was 56 years old with secondary education.

The central point of the second cluster described a farm with 210 cows in the main herd and 7305 liters average milk yield. Cows were included in the main herd at the age of 24 months and were used for 5 lactations as average, with 20% annual cull rate of cows. The farmer

was 49 years of age with higher education.

The most significant problems for farmers were the insufficient access to credits, high prices of raw materials, low purchase price of the production, difficulties in selling the production, leaving staff, difficulties in finding suitable staff, difficulties in providing veterinary services. For the farmers, it was the most difficult to find veterinary, financial and accounting, marketing and selection information, as well as information on feeding and animal keeping. As sources of information, farmers indicated: veterinarian, accountant, Agricultural Advisory Service, consultants, professional organizations, sales representatives, and internet.

References

- Alvarez, A., Corral, J. Del, Solis, D. & Pérez, A. (2008). Does Intensification Improve the Economic Efficiency of Dairy Farms? *Journal of Dairy Science*, 91 (9), 3693-3698.
- Bramley E., Lean, I. J., Fulkerson, W. J., Stevenson, M. A., Rabiee, A. R. & Costa, N. D. (2008). The Definition of Acidosis in Dairy Herds Predominantly Fed on Pasture and Concentrates. *Journal of Dairy Science*, 91(1), 308-321.
- Dirimanova, V. (2018). The role of the extension services for the development of the small-scale farms in Bulgaria. *Bulgarian Journal of Agricultural Science*, 24 (1), 35-39.
- Doitchinova, J., Terziyska, R., Petrovic, A. & Colic, M. (2017). Increasing the competitive potential of agricultural holdings through collaboration and cooperation. *Trakia Journal of Sciences*, 15 (Suppl. 1), 71-76.
- Guadu, T. & Abebaw, M. (2016). Challenges, Opportunities and Prospects of Dairy Farming in Ethiopia: A Review. *World Journal of Dairy & Food Sciences*, 11 (1), 1-9.
- Hahlani, C. D. & Garwi, J. (2014). Operational Challenges to Smallholder Dairy Farming: The Case of Mayfield Dairy Settlement Scheme in Chiping District of Zimbabwe. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 19 (1), Ver. IV (Jan. 2014), 87-94.
- Harizanova, H. (2010). Economic results agricultural activities

- of the semi-subsistence farms in Bulgaria. *Management And Sustainable Development*, 3-4/2010 (27), 251-255.
- Ministry of Agriculture, Food and Forestry** (MAFF 2002). Farm Animals in Bulgaria. November 1, 2002.
- Ministry of Agriculture, Food and Forestry** (MAFF 2017). Farm Animals in Bulgaria. November 1, 2017.
- Pigott, T. D.** (2001). A Review of Methods for Missing Data. *Educational Research and Evaluation*, 7 (4), 353-383.
- Ravagnolo, O. & Misztal, I.** (2002). Studies on Genetics of Heat Tolerance in Dairy Cattle with Reduced Weather Information via Cluster Analysis. *Journal of Dairy Science*, 85 (6), 1586–1589.
- Stankov, K.** (2015). Economic efficiency analysis of dairy cattle farms in Bulgaria. *Trakia Journal of Sciences*, 13 (Suppl. 1), 226-232.
- Tiwari, M. & Misra, B.** (2011). Application of Cluster Analysis in Agriculture – A Review Article. *International Journal of Computer Applications*, 36 (4), 43-47.
- Usai, M. G., Casu, S., Molle, G., Decandia, M., Ligios, S. & Carta, A.** (2006). Using cluster analysis to characterize the goat farming system in Sardinia. *Livestock Science*, 105, 63-76.

Received: March, 27, 2019; *Accepted:* July, 4, 2019; *Published:* October, 31, 2019