ECONOMIC CHARACTERISTICS OF COW'S MILK PRODUCTION ON FAMILY HOLDINGS IN SHUMADIYA AND WESTERN SERBIA

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Abstract

The subject of research in this paper is the production of cow's milk on family holdings in Serbia, on the example of the region Shumadiva and Western Serbia. By identifying the different sizes of dairy cow holdings in practice and based on the analysis of the data collected by the field survey, the most important economic features of milk production were determined, which is the main goal of this research. By applying descriptive statistics methods, it was determined that the largest share in the samples is made up of cow holdings with a size of 9 to 14 head. In the ration structure of all sizes of holdings in both samples, coarse feed makes up from 36% to 45%, and concentrated feed from 55% to 64%, which depends on the sample and therefore on the feeding season of the cows. In the total amount of milk per head of a dairy cow, the first class of milk makes up from 31% to 36%, the second class from 28% to 30%, the third class from 18% to 19% and milk outside the class from 18% to 20% according to the samples, with the more favorable structure in the first sample. According to economic indicators, the most successful is the third group of holdings with a size of 15 to 20 dairy cows in the second sample. According to the ranked seven economic indicators, this group of holdings is in first place based on three indicators, and based on the remaining four, it is ranked second. In second and third place are the groups of the largest holdings in the second and first sample, respectively. The fourth place belongs to another group of cow holdings with a size of 9 to 14 heads, also in the second sample. The rationalization of milk production costs is recommended, which is based on proper planning of the quantity, quality, structure and price of animal feed. The structure of the meal should be improved, i.e. that it contains all substances by type, quantity and quality that the throat needs according to age, production characteristics and other characteristics, as well as that the meal is financially favorable so that the holding is economically profitable and enables the economic sustainability of the holding.

Key words: family holdings, dairy farms, economic analysis, characteristics of milk production

INTRODUCTION

Population growth and changes in dietary habits are driving demand for agricultural products, both in terms of increasing quantity and product diversification [2, 19]. Livestock is an integral component of agriculture and the food industry, serving as the backbone of food production systems around the world [4, 20]. Cattle production is of great importance for rural areas and the sustainable Agricultural development. producers in Shumadiya and Western Serbia traditionally produce milk on family farms [21]. Crop production accounts for 69.80%, and livestock

production for 30.20% of the total value of agricultural production in the Republic. The net index of the physical volume of agricultural production in Serbia in the current year is 8.50% higher than in the previous year. In the total utilized agricultural area of the Republic of Serbia, fields and gardens account for 76.70%, orchards for 5.70%, vineyards for 0.50%, meadows for 9.40% and pastures for 7.00%. In the structure of sown areas of arable land and gardens, cereals take part with 67.80%, industrial plants with 19.10%, vegetable plants with 1.80% and fodder plants with 8.00% [9, 25]. The total number of cattle in the Republic of Serbia is 725,000 heads, of

which 355,000 are dairy cows. Annual cow milk production in Serbia is around 1.4 billion liters. The number of conditional heads decreased (by 10.80%) compared to the previous year, as did cow milk production (by 5.70%), while meat production increased (by 0.70%). Compared to the previous year, the value of livestock production is 5.30% lower. Within the structure of livestock production, the value is lower in cattle farming, by 6.90%, in pig farming, by 5.80%, and in sheep farming, by 3.60%, and higher in poultry farming, by 1.00% [25]. Due to the small number of quality breeding cattle, the insufficient level of quality of livestock products (milk, meat, etc.), as well as the lower production characteristics of cattle compared to countries with developed cattle breeding and EU member states, it is evident that livestock production in Serbia is less competitive compared to livestock production in those countries [23,16]. Of the represented breeds of cattle that are raised in Serbia, the largest share, about 80% of the total number of cattle, is the Simmental breed, the so-called "Serbian Simmental". A very significant the change in the racial impact on composition of cattle was achieved by the introduction of artificial insemination of cattle, the importation of breeding cattle, the application of selection, as well as the crossing of domestic autochthonous breeds with noble breeds of cattle [14].

Holdings with small farms (1-9 head of dairy cows) are relatively acceptable in terms of profitability, due to the involvement of family members [15]. However, such farms have a low yield rate, around 36%. Due to the insufficient productivity of animals and the small volume of final product realization, the efficiency of small farms is not satisfactory. Collaborations between different sectors, e.g. such as agriculture, technology and finance, drive innovation for sustainable solutions, addressing challenges related to food security and environmental sustainability [6, 28, 29]. Farmers have a significant role in the national economy, and increasing their activities can stimulate rural development and the local economy [11, 26, 27]. The construction of production capacities on the farm aims to

the amount of investment required per head, and therefore significantly lower capital costs per unit of product obtained [2, 22, 23]. Animal nutrition has a major impact on the profitability of family farms [1, 3]. In the total costs of keeping dairy cows, the largest share is the cost of feed and ranges from 45% to 60% [19, 15, 24]. Similar results are also according to the research of other authors who state that in the structure of the costs of keeping dairy cows, the share of food costs is from 50% to 60% [16]. Farms achieving less than 5,000 liters of milk per cow per year are not sustainable, while farms with 5,000-6,000 liters per cow are sustainable but not competitive, and farms with over 6,000 liters of milk per cow are both sustainable and competitive [8]. The production of cow's milk depends on the existing genetic potential of the cow, the application of appropriate nutrition technology, the achievement of the necessary level of milking hygiene and the adequate implementation of the entire scope of work on dairy cow farms. One of the ways to improve the genetic potential of cows for milk production is by importing quality breeding cows. The positive effects of the import of breeding heifers of the Simmental breed on the improvement of milk yield and fertility characteristics of the cow population were determined in Shumadiya [13, 23]. Monitoring and recording data during production on holdings can contribute to more efficient use of production resources and better business planning and [17, 18, 28, 30]. Numerous economic factors. market conditions, etc. also affect the results of cow's milk production on family holdings. On most holdingss, plant production is organized as a feed base for livestock production [20]. Therefore, the subject of research in this paper is the economic aspects of dairy cow farms on family holdings in Shumadiya and Western Serbia. The main goal of the research is to determine basic characteristics of cow milk production based on real field data and to provide recommendations for its improvement as the basis for the economic sustainability of family farms.

reduce labor costs per head or unit of product,

MATERIALS AND METHODS

According to the subject and the set goal of the research, family farms with dairy cow farms were selected, which are located in the region of Shumadiya and Western Serbia and where milk is produced from cows is the main or only source of income. The focus is on market-oriented farms from which 30,000 and more liters of cow's milk are delivered to dairies, on average per year. In cooperation with the Agricultural Advisory Service of Serbia, a survey was conducted in the mentioned area during 2019-2022 year on 219 family agricultural farms, where the survey was carried out twice in the first and third quarters of milk production on a larger number. A total of 391 survey questionnaires were collected from producers of cow's milk. The survey covered data on the number of dairy cows, feed costs and other inputs in keeping dairy cows, as well as the quantity, price and quality of milk delivered from the farm. Based on the collected data, descriptive statistical analysis was used to review the general characteristics of dairy farms, such as: size, structure, volume of milk production, and others, based on which the parameters for the economic analysis were determined. After the descriptive analysis and economic indicators, the ranking of the survey results of samples 1 and 2 for both quarters was done.

RESULTS AND DISCUSSIONS

Sizes of cow farms and production capacities for different sizes of dairy farms Starting from the fact that the size of the farm on the farm has a significant impact on the production and economic results in the production of cow's milk, and for the further analysis process, groups of farms were determined according to their sizes.

The sizes of the farms on the farms where the survey was conducted were determined based on the number of cows, and then their interval grouping was performed. Depending on the number of head of cows, four groups of farms are defined: group of up to 8 head of dairy cows; a group of 9 to 14 dairy cows; a group of 15 to 20 dairy cows; and a group of over 20 dairy cows. The number of farms depending on their size, as well as their share in the first and second samples is given in Table 1.

Farm size	Sample	21	Sample 2		
	Number of farms	Share (%)	Number of farms	Share (%)	
Up to 8 dairy cows	41	23.84	52	23.74	
From 9 to 14 dairy cows	77	44.77	103	47.03	
From 15 to 20 dairy cows	39	22.67	43	19.64	
Over 20 dairy cows	15	8.72	21	9.59	
Total:	172	100.00	219	100.00	

Table 1. Number and share of dairy farms according to their size in samples 1 and 2

Source: Author's calculation based on data collected on family holdings

According to the analysis in Table 1, it was determined that the largest share is made up of farms with 9 to 14 heads of dairy cows, 44.77% in sample 1 and 47.03% in sample 2. The smallest share is made up of farms with more than 20 heads, 8.72% in sample 1 and 9.59% in sample 2. Dairy farms are a key component of the dairy sector and their development directly affects milk production [10, 5, 11, 13]. First, an analysis was made based on the data of individual samples, then an analysis and comparison of the determined indicators was carried out. In the first group of

farms (up to 8 heads) in the first sample, the number of dairy cows was 283 heads in total. The average number cows in this group was 6.9 heads and varied in the interval from 5 to 8 heads. The coefficient of variation was moderate and amounted to 16.30%. Almost a quarter of the farms on which the survey was conducted belong to this group, and according to the number of heads, 13% on the analyzed holdings out of the total number of dairy cows. According to the size (from 9 to 14 heads) in the second group of farms the number of dairy cows amounted to a total of

855 heads. The average number of cows in this group was 11.1 heads, and the number physical heads was within the given interval. The coefficient of variation was moderate, slightly lower than the first group and amounted to 12.90%. Almost half of the surveyed farms in the first sample belong to this group. The second group accounts for 30% of the total number of cows. The total number of dairy cows in the third group of farms (from 15 to 20 heads) was 655 heads. In the same group, the average number of cows was 16.8 heads, while the number of cows varied in a certain interval. The coefficient of variation was also moderate, but higher than in all surveyed groups of the first and second sample and was 11.40%. According to the number of holdings included in the survey in the first sample, the third group is slightly smaller than the first group. This means that this group includes slightly less than a quarter of the surveyed farms in the first sample. The third group also includes almost a quarter of the total number of cows (approximately the same as the number of farms). The fourth groups of cow farms with a size of over 20 heads are located on 15 farms with a total number of milking cows of 414 heads. The average number in this group was 27.6 heads of milking cows, and the number of cows varied from 21 to 41 heads. The coefficient of variation was the highest of all groups of the first sample and amounted to 23.90%. According to the number of farms analyzed in the first sample, the fourth group is the smallest. This group includes slightly less than 9% of the number of farms that were included in the research in the first sample. The fourth group makes up about 15% of the total number of dairy cows. When looking at the second sample, there are a total of 354 cows in the first group of dairy farms. The average number cows in this group was 6.8 heads (almost identical to the first sample). The number of cows' heads varied in the interval from 4 to 8. The coefficient of variation was moderate and amounted to 18.40%. This group includes (as in the first sample) almost a quarter of farms on which the survey was conducted, and which produce cow's milk. The farms of the first group included about 13% of total number of dairy cows. The second group of dairy farms included a total of 1,154 cows. As in the first sample, this is the largest group. The average number of cows in this group was 11.2 heads. The number of cows was within the given interval (9-14 heads). The coefficient of variation was lower than the first group of farms and amounted to 14.10%. Half of the surveyed farms in the first sample belong to this group.

The second group includes over 40% of the total number of cows. In the third group of dairy cow farms, a total of 731 cows are included. The average number of cows in this group was 17 heads. The number of cows varied within the given interval. The coefficient of variation was the lowest of all analyzed groups of the second sample and slightly higher (by 0.10%) than the same group of the first sample and was 11.50%. In terms of the number of farms covered by the survey, the third group is 17% smaller than the first group. This group makes up slightly less than a fifth of the number of farms covered by the survey in the second sample. The third group includes over a quarter of the total number of dairy cows (approximately the same as in the first sample).

In the fourth group of milking cow farms, the size of which is over 20 heads, 21 farms with a total number of 590 heads are included. The average size of this group of farms is 28.1 head, and the number of cows varied from 21 to 50 head. The coefficient of variation was the highest of all groups of both samples and amounted to 27.70%. According to the fourth group is the smallest, considering the number of farms covered by the survey in the second sample. This group accounts for less than 10% of the number of farms covered by the survey. The fourth group has a share of almost 21% of the total number of dairy cows. The survey collected data on the type of feed by farm, as well as elements of other costs of keeping dairy cows. The analysis determined the share of concentrated and coarse fodder in the total costs of fodder for all sizes of farms in both samples (Table 2).

Table 2. Structure of feed costs per head of dairy cow by group in samples 1 and 2								
	Structure of animal feed costs (%)							
Type of animal feed	Sample 1/ Groups				Sample 2/ Groups			
	1	2	3	4	1	2	3	4
Concentrated food	59.92	55.48	57.40	58.69	64.43	60.28	56.53	62.85
Bulk food	41.08	44.52	42.60	41.31	35.57	39.72	43.47	37.15
Total:	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Author's calculation based on data collected on family holdings.

In all observed groups of farms according to size and in both samples, concentrated nutrients account for a larger share of animal feed costs. Their share ranges from 64% in the first group of the second sample to 55% in the second group of the first sample. In all groups in the second sample, except for the third group of farms (size from 15 to 20 heads), the share of the costs of concentrated feed is higher than in the analogous groups of the first sample. In the second sample compared to the first, the intensity of milk production increased, expressed by the amounts of concentrated feed costs and total feed costs. The cost of coarse feed is fairly uniform per head of dairy cow, regardless of the size of the farm and the intensity of cow's milk production. The most intensive production is when the size of the cow farm is up to 8 head. With the increase in the number of cows on the farm (in both samples) up to 20 heads (groups 2 and 3), the amount of feed costs per head of cow decreases, so the intensity decreases.

However, with intensive production (the second sample), the production intensity per head is practically equal to the production intensity in the first group of the second sample. In the structure of animal feed costs, the share of concentrated feed costs ranges from 55% to 64%.

The ratio of coarse and concentrated nutrients in the meal has a great influence on the quantity and quality of milk. Unfavorable price parities of cow's milk and concentrated feed have a negative effect on the economy of production, as well as on increasing the intensity of production. An increased amount of concentrated feed in the cow's ration has a positive effect on the milk yield per cow, which increases the intensity of production. Research results, as well as the experience of producers, show that a significant increase in the milk yield of dairy cows on family farms can be achieved by improving the nutrition of cows, which consists in improving the structure and type of meals.

Production and economic characteristics of cow's milk production

The dairy industry is a vital sector on a global scale, with milk fat content playing a key role in assessing the quality of dairy products and influencing the economic and nutritional aspects of the industry's products [1, 7, 12].

According to the first survey (sample 1), data was collected from 172 farms with a total of 2,202 dairy cows.

The average size of the farm was 12.8 head of cows. The number of dairy cows per farm ranged from 5 to 41 cows. The coefficient of variation of the number of cows per farm is very high and amounts to 48.10%. The average milk yield was 5,387.30 liters of milk per head of dairy cow per year, and it varied in the interval from 2,607 to 9,125 liters.

The coefficient of variation of cow's milk yield among farms is 25.90%, which can be rated as moderately high. The second survey (sample 2) was conducted in the third quarter of 2019.

Through the process of surveying producers of cow's milk, data was collected from 219 farms with a total of 2,825 heads of dairy cows. This number includes, as stated above, 172 farms where the first survey was conducted and another 47 new farms that have a cow farm and from which milk is delivered to dairies. The average size of the dairy cow farm per farm, compared to sample 1, practically did not change and amounts to 12.9 head. The number of dairy cows per farm varies between four and fifty heads. In this case too, a very high coefficient of variation of the number of cows per farm of 51.20% is noticeable. The average annual milk yield per dairy cow is 5,649.2 liters. Milk production

varies between 2,555 and 9,733 liters per head.

The coefficient of variation of milk yield is 26%, which is a moderately high coefficient. In the further analysis procedure, a comparative analysis of production and economic features in milk production between the first and second samples was conducted (Table 3). The disadvantage is that the surveys were conducted at different times of the year. The first sample was taken in winter, when in milk production there is generally higher milk yield and better milk quality due to low temperatures. The second sample was taken in the summer months when, due to high temperatures, the milk yield of cows and the quality of milk decrease.

However, despite the unfavorable impact of the season on milk production parameters, the comparative analysis showed that average milk production per cow increased by over 260 liters, or almost 5%. When analyzing the structure of milk quality, the summer period took its toll. The percentage of first-class milk decreased by 14% and percentage of non-class milk was increased by 11%. It is relatively favorable that the percentages of the second class of milk increased by 7% and the third class by 6%.

Table 3. Quantities and share of classes in the total amount of milk per head of dairy cow in samples 1 and 2 and index of changes

Milk production by the throat of	Sam	ple 1	Samp	Index (sample 1 = 100)	
a dairy cow	Quantity (L)	Quantity (L)Share (%)			
First class	1,939.44	36.00	1,751.25	31.00	86.10
Second class	1,508.44	28.00	1,694.76	30.00	107.10
Third class	969.71	18.00	1,073.35	19.00	105.60
Milk out of class	969.71	18.00	1,129.84	20.00	111.10
Total quantity:	5,387.30	100.00	5,649.20	100.00	104.90

Source: Author's calculation based on data collected on family holdings.

According to the analysis of the share of individual classes by samples and the comparison of samples, it can be concluded that the largest share per sample is the first class of milk, but the share in the first sample is 13.90% higher compared to the long sample. Shares of second, third and unclassified milk range from 18% to 30% in both samples, with the shares in the first sample being higher from 4.90% to 11.10% compared to the second sample.

Rank of milk production indicators by groups of dairy cow farms in both samples

Based on the results of this research and the examined sample of 391 dairy cow farms located on family farms in Shumadiya and Western Serbia with a total of 5,027 head of dairy cows in both samples, this part summarizes the indicators and makes their ranking.

Based on the first sample with 179 dairy farms and an average milk production of 5,387.3 liters per head and the second sample with 217 farms and milk production of 5,649.2 liters per head, it can be concluded that milk production without government incentives is at the break-even point. It is economically profitable, first of all, due to the high yield of milk per head, which was 5,534 liters of milk and was significantly above the average of the Republic of Serbia.

The milk yield on the examined farms was 57.5%, or 2,021 liters higher than the Serbian average, i.e. 3,513 liters/head of dairy cow. With state incentives, the profitability limit of milk production is 2,252 liters per head of milking cow per year (for the first sample, 2,497.9 liters per head of cow, and for the second sample, the profitability limit is at the level of 2,007 liters per head of cow).

When the state incentives of both samples are calculated, a profit is realized, and in the first sample, an average of 59,956 RSD, and in the second sample, 68,198 RSD per head of cow per year. The average financial result per liter of milk in both samples without incentives amounts to RSD 0.14. With state incentives, the average profit per liter of milk in both samples is 11.61 RSD, with the profit in in the first sample it is around 11.13 dinars, and in

the second it is 12.07 dinars. Looking at the average efficiency of milk production in both samples, it is 1.01 without state incentives, where according to the results it can be seen that milk production in the first sample is uneconomical (0.98), while in the second sample it is 3%, i.e. above the economic limit (1.03). Analyzing with state benefits, the average efficiency is 1.55, where in the first sample the efficiency is 1.53, and in the second 1.57. The general analysis is that milk production in both samples is on average economical. The highest amount of profit per cow in the first sample is achieved on farms with 15 to 20 cows, and in the second sample on farms with cows of over 20 head size.

The maximum economy of production is achieved in the first sample on farms with a size of 15 to 20 head of cows, and in the second sample on farms with a size of more than 20 head of cows. In the next step, the appropriate size of the farm was selected and its place in the sample in which the most favorable production and economic results were obtained. For this purpose, three groups of indicators were compared: production indicators, costs and economic results. The group of production indicators includes milk production per head of dairy cow and the percentage share of certain classes of milk. According to the indicators, the best-ranked farms are in the first place, and the weakest are in the last, eighth place.

The groups of farms with the highest milk production per head of cow and the highest percentage of milk in the first and second class were assigned the most favorable rank, 1. In the percentage of milk of the third class and milk outside the class, the best rank (1) was assigned to the groups of farms with the lowest percentage (Table 4).

This is logical, because the percentages of third class milk and milk out of class are negative indicators of production success. The groups of farms that have the highest value of the rank number in the overall ranking represent dairy cow farms with unfavorable indicators of milk production. On the other hand, the groups of farms that have the lowest value of the rank number in the overall ranking represent the farms that achieved the most favorable indicators of milk production.

Indicators	Sample 1 / Groups according to the number of dairy cows				Sample 2 / Groups according to the number of dairy cows			
	< 8	9-14	15-20	>20	< 8	9-14	15-20	>20
Milk production per head of dairy cow	1	7	8	6	2	4	3	5
% first class milk	8	5	2	1	6	7	4	3
% second grade milk	7	1	3	8	5	2	4	6
% third grade milk	8	3	1	6	7	4	2	5
% milk out of class	7	1	2	6	4	5	3	8
Total Rank:	31	17	16	27	24	22	16	27

Table 4. Rank class of milk production per head of dairy cow for all groups of farms for both samples

Source: Calculation of the authors.

According to the established rank of milk classes, it was determined that the best effects are given by cow farms with a size of 15 to 20 heads in both samples. They have the identical lowest rank total (16). The following are cow farms with a size of 9 to 15 cows in the first and then in the second sample.

The largest cow farms (over 20 cows) in both samples have the same total rank number (27). It is interesting that the worst group of farms is up to 8 head in the first sample, while the same group in the second sample (total rank number 24) is better than the largest group of cow farms in both samples. The group of indicators of production costs includes costs per head of dairy cow, namely: costs of concentrated and coarse feed in particular, total costs of animal feed and total costs in milk production.

Farm groups with the highest costs were assigned the best rank (1) and those with the lowest costs the worst rank (8). It was assumed that the level of costs for animal feed is an indicator of the level of production intensity on which production and economic effectiveness depend. However, this has

generally not proven to be true, especially without state incentives, and the reason for this is the unfavorable relationship between the price of animal feed and the price of milk. Table 5 shows the ranking of costs by farm groups in samples 1 and 2.

Table 5. Kank of milk production	costs of all groups of dairy cow farms in s	samples 1 and 2
	Sample 1 / Groups according to the	Sample 2 / Groups accor
Conta of ontineal food	number of dairy cowe	number of dairy

Costs of animal feed	Sample 1 / Groups according to the number of dairy cows				Sample 2 / Groups according to the number of dairy cows			
	< 8	9-14	15-20	>20	< 8	9-14	15-20	>20
Concentrated food	2	8	6	7	1	4	5	3
Bulky food	1	6	7	8	4	5	2	3
Animal feed - total	2	7	6	8	1	5	4	3
Total costs	1	6	7	8	2	5	4	3
Total Rank:	6	27	26	31	8	19	15	12

Source: Calculation of the authors.

According to the cost ranking, the best results are for the farms of the first group in both samples (total rank number 6). They are followed by the fourth (total rank 12), third (total rank 15) and second group of farms in the second sample (total rank 19). Other groups of farms from the first sample were ranked at a much lower level. In general, the production of milk per head of dairy cow, considering the amount of feed costs, is much more intensive in the second sample. This can be explained as a result of the positive effect of the summer feeding regime of cows and the results of the implementation of the breeding selection program. The group of and

economic indicators includes total income, net income and profit per head of dairy cow and per liter of milk. The mentioned indicators are absolute measures of economic success (measures of economic effectiveness), i.e. indicators of production intensity. In addition, the economy of production was also used as an economic indicator of success. Similar to the cost ranking, farm groups with the most favorable economic indicators are ranked first. and those with the weakest are ranked last, in this case eighth. Individual economic ranks, as well as the overall rank of economic results of individual groups of farms in both samples are shown in Table 6.

Production and economic	Sample 1 / Groups according to the number of dairy cows				Sample 2 / Groups according to the number of dairy cows			
effects	< 8	9-14	15-20	>20	< 8	9-14	15-20	>20
Total income per cow	4	8	7	6	3	5	1	2
Net income per cow	8	6	4	2	7	3	1	5
Profit per cow	8	6	4	2	7	3	1	5
Total revenue per liter of milk	8	7	4	5	6	3	2	1
Net income per liter of milk	8	5	4	1	7	3	2	6
Profit per liter of milk	8	5	4	1	7	3	2	3
Economy of production	6	5	4	1	8	3	2	6
Total Rank:	50	42	31	18	45	26	9	17

Table 6. Rank of economic results of milk production by groups of dairy cow farms in samples 1 and 2

Source: Calculation of the authors.

As can be seen in Table 6, the most economically successful is the third group of farms with a size of 15 to 20 dairy cows in the second sample. Out of the seven ranked indicators, this group of farms is in first place based on three indicators, and based on the remaining four, it is ranked second. In second and third place are the groups of the largest farms in the second and first sample, respectively. The fourth place belongs to another group of cow farms with a size of 9 to 14 heads, also in the second sample. In the first sample, the profitability of milk production increases with the increase in the number of cows on the analyzed farms. Maximum milk production does not necessarily mean maximum economic profitability. The farms of the first group in the first sample, despite the highest average milk production per head of cows, show the weakest economic results.

The producer's influence on the increase in the sale (repurchase) price of milk is quite limited. Therefore, producers should strive to rationalize production costs, that is, to achieve the lowest possible cost price per unit of milk produced.

Rationalization of milk production costs involves planning the quantity, quality, structure and price of animal feed. The rationalization of the structure of the meal is significant, which implies that the meal contains all substances by type, quantity and quality that the throat needs considering age, production characteristics and other characteristics, as well as that the meal is financially favorable from the aspect of business.

CONCLUSIONS

The sizes of the farms on the holdings where the survey was conducted were determined based on the number of cows, and then they were grouped by intervals. It was found that the largest share is made up of farms with 9 to 14 heads of dairy cows, 44.77% in sample 1 and 47.03% in sample 2.

The smallest share is made up of farms with over 20 heads, 8.72% in sample 1 and 9.59% in sample 2. For the first sample, data was collected from 172 farms where a total of 2,202 dairy cows are kept. The average size of the farm was 12.8 head of cows. The number of dairy cows per farm ranged from 5 to 41 cows.

The coefficient of variation of the number of cows per farm is very high and amounted to 48.10%. The average milk yield was 5,387.30 liters of milk per head of dairy cow per year. The coefficient of variation of milk yield among farms is 25.90%, which can be rated as moderately high. For the second sample, the survey was conducted in the third quarter of the calendar year. Data were collected from 219 farms with a total of 2,825 dairy cows. This number includes, as stated above, 172 farms where the first survey was conducted and another 47 new farms that have a cow

farm and from which milk is delivered to dairies.

The average size of the dairy cow farm per farm, compared to sample 1, practically did not change and amounts to 12.9 head. The number of dairy cows per farm varies between four and fifty heads. In this case too, a very high coefficient of variation of the number of cows per farm of 51.20% is noticeable.

The average annual milk yield per dairy cow is 5,649.2 liters. The change index showed that the average milk production per head of cow increased by over 260 liters or close to 5%. Considering the quality of milk, the summer period had an unfavorable effect. The percentage share of first-class milk fell by 14% and percentage of non-class milk was increased by 11%. It is relatively favorable that the percentages of the second class of milk increased by 7% and the third class by 6%.

The results show that the best effects for cow farms are between 15 and 20 cows in both samples. They have the identical lowest rank total (16). The following are cow farms with a size of 9 to 15 head of cows in the first and then in the second sample. The largest cow farms (over 20 cows) in both samples have the same total rank number (27).

It is interesting that the worst group of farms is up to 8 head in the first sample, while the same group in the second sample (total rank number 24) is better than the largest group of cow farms in both samples.

According to the cost ranking, the best are the farms of the first group in both samples (total ranking number 6). They are followed by the fourth (total rank 12), third (total rank 15) and second group of farms in the second sample (total rank 19).

Out of the seven ranked indicators, this group of farms is in first place based on three indicators, and based on the remaining four, it is ranked second. Rationalization of milk production costs is based on proper planning of livestock ration. It is important to rationalize the structure of the meal, which implies that the meal contains all substances by type, quantity and quality that the throat needs considering the age, production characteristics and other features, as well as that the meal is financially favorable from the aspect of business and sustainability of the farm.

Based on the first sample with 179 dairy farms and an average milk production of 5,387.3 liters per head and the second sample with 217 farms and milk production of 5,649.2 liters per head, it can be concluded that milk production without government incentives is at the break-even point.

It is economically profitable, first of all, due to the high yield of milk per head, which was 5,534 liters of milk and was significantly above the average of the Republic of Serbia. With state incentives, the profitability limit of milk production is 2,252 liters per head of milking cow per year (for the first sample, 2,497.9 liters per head of cow, and for the second sample, the profitability limit is at the level of 2,007 liters per head of cow).

When the state incentives of both samples are calculated, a profit is realized, and in the first sample it averages 59,956 dinars, while in the second it is 68,198 dinars per head per year.

In both samples without state subsidies, the average milk production efficiency is 1.005, and according to the results, milk production in the first sample is uneconomical (0.98), and in the second sample it is 3% above the economic limit (1.03). With government benefits, the average efficiency is 1.55, with the efficiency in the first sample being 1.53 and the second being 1.57.

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