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The Caucasus Mineral Waters Region and its contribution to food security

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ABSTRACT

LLC "Agrofirma" Village named after G.V. Kaishev" and LLC "Pyatigorsk Dairy Plant" are a modern agricultural holding, which carries out a full closed cycle - from the production of animal feed and raw milk to a wide range of dairy products. **Objective:** Analysis of the contribution of the Caucasus Mineral Waters region to food security, by studying the productive efficiency of the agricultural holding LLC "Agrofirma" Village named after G.V. Kaishev" LLC "Pyatigorsk Dairy Plant". **Materials and methods.** Data of statistical reporting, zootechnical and production accounting, subjected to systematization and critical analysis by the method of scientific knowledge. **Results.** Production buildings are located on a flat hill, and around the land for growing feed, which allows to provide all livestock with feed of own production. The daily volume of milk supplied for processing to "Pyatigorsk Dairy Plant" LLC is about 40 tons. Milk production is cost effective. In the near future, it is planned to increase the dairy herd from 1200 to 3860 heads and milk production to 200 tons. **Conclusion.** The key to obtaining high milk productivity and milk quality is optimal conditions for keeping, feeding and milking animals. This is a serious contribution to solving the problem of food security in the KMV region (Kavkazskie Mineralnye Vody).

KEYWORDS: dairy farming; food safety; agricultural holding, milk; production.

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La Región Aguas Minerales del Cáucaso y su contribución a la seguridad alimentaria

RESUMEN

LLC "Agrofirma" Village que lleva el nombre de G.V. Kaishev "y LLC" Pyatigorsk Dairy Plant "son una explotación agrícola moderna, que lleva a cabo un ciclo cerrado completo, desde la producción de alimentos para animales y leche cruda hasta una amplia gama de productos lácteos. Objetivo: Análisis de la contribución de la región Aguas Minerales del Cáucaso a la seguridad alimentaria, mediante el estudio de la eficiencia productiva de la explotación agrícola LLC "Agrofirma" Village que lleva el nombre de GV Kaishev "LLC" Pyatigorsk Dairy Plant". Materiales y métodos. Datos de reporte estadístico, zootecnia y contabilidad de producción, sometidos a sistematización y análisis crítico por el método del conocimiento científico. Resultados. Los edificios de producción están ubicados en una colina plana y alrededor de la tierra para el cultivo de piensos, lo que permite proporcionar a todo el ganado pienso de producción propia. El volumen diario de leche suministrada para su procesamiento a "Pyatigorsk Dairy Plant" LLC es de aproximadamente 40 toneladas. La producción de leche es rentable. En un futuro próximo, se prevé aumentar el hato lechero de 1200 a 3860 cabezas y la producción de leche a 200 toneladas. Conclusión. La clave para obtener una alta productividad y calidad de la leche son las condiciones óptimas para el mantenimiento, la alimentación y el ordeño de los animales. Esta es una contribución importante para resolver el problema de la seguridad alimentaria en la región de Kavkazskie Mineralnye Vody (KMV).

PALABRAS CLAVE: ganadería lechera; seguridad alimentaria; explotación agrícola, leche; producción.

Introduction

Sustainable provision of dairy products to the population of the country is one of the priority tasks of state policy aimed at creating conditions for food security. Food security of the region the ability of the food system to provide foodstuffs stably and evenly throughout the year for all categories of the population of the relevant territories in the amount of consumption that meets scientifically grounded medical standards.

This article is divided into five sections. This introduction is followed by a brief review of the literature on the role of agricultural holdings combining milk production and processing in providing dairy products to regions. The following sections outline the purpose, methods and results of the study, which reveal its essence by analyzing all stages of milk production. In conclusion, the conclusions on the work are presented, confirming the contribution of this agricultural holding to the food security of the KMV region.

Academician of the Russian Academy of Sciences A. G. Khramtsov emphasizes the role of holding companies in increasing the production of raw milk (for example, two agricultural enterprises - "Novomaryevskoe" and "Milk Chernozemya") (Khramtsov, 2017).

According to I.G. Mezenchuk, specific regions in ensuring food security are special resort regions (Krasnodar Territory, Caucasian Mineral Waters), in which the assessment of food security should take into account the number of visitors and growing environmental problems in the development of the region, the possibility of developing alternative activities (Mezenchuk, 2016; Rodríguez & Mirabal, 2020).

At the same time, the basis for ensuring food security in the region is to increase the efficiency of dairy cattle breeding and the production of raw milk sufficient for processing capacities. This is facilitated by the creation of a solid feed base, improvement of the organizational and economic structure of the pricing industry and state support (Trukhachev et al., 2018).

A.I. Trubilin et al. note the expediency of organizing on-farm industrial milk processing in the context of aggravated competition in the regional agri-food market and significant price disparity. Improving relationships along the chain "production - processing - sale" allows producers to quickly respond to external competition, form and implement strategic solutions for the best use of available resources (Trubilin et al., 2017).

One of the options for improving the organizational and economic relations of the subjects of the market for milk and dairy products on an innovative basis is the formation of clusters or the creation of agricultural holdings uniting the interests of milk producers and processors (Eydis & Chutcheva, 2014; Stolyarova & Stolyarova, 2017; Misakov et al, 2018).

The Kavkazskie Mineralnye Vody region, which is part of the Stavropol Territory, is experiencing a significant shortage of raw milk and underutilized processing facilities (Sycheva, 2018).

Objective of the work: Analysis of the contribution of the Caucasus Mineral Waters region to food security, by studying the productive efficiency of the agricultural holding LLC "Agrofirma" Village named after G.V. Kaishev" LLC "Pyatigorsk Dairy Plant".

1. Materials and methods

Statistical reporting data, zootechnical and production accounting, subjected to systematization and critical analysis by the method of scientific knowledge ¹.

2. Results and discussion

The largest European-level agricultural holding in the North Caucasian Federal District (NCFD), LLC “Agrofirma “Village named after G.V. Kaishev,” LLC “Pyatigorsk Dairy Plant”, focused on the production of elite milk raw materials and efficient milk processing, celebrates its 15th anniversary. This is practically the first complex in the region of the Caucasian Mineral Waters (KMV), which has its own feed and raw materials base, which allows organizing the entire production chain - from the production of animal feed and raw milk to the production of a finished natural dairy product in modern aseptic packaging.

In 2005, literally in an open field on a hill near the village of Suvorovskaya in the Stavropol Krai, the first production building was built using American technology for keeping a milking herd and elite Holstein-Friesian animals were brought in. Milking of cows is provided in the milking parlor with the use of “Europarallel” milking equipment for 40 places of simultaneous milking. Later, two more buildings for dairy cows, silage and haylage trenches, manure lagoons for 14 thousand cubic meters were put into operation. m, sanitary access, housing for dry cows, engineering networks, communications.

The territory for the construction of the complex was chosen very well - the production buildings were built on a flat hill, and there are grounds for growing fodder around (Figure 1). The problem with the food supply for this enterprise was solved from the very beginning.

Keeping cows in LLC "Agrofirma" Village named after G.V. Kaishev" is loosely. Animals are housed in three spacious buildings, each of which can accommodate 576 animals. The cows are housed in sections equipped with three-layer polyurethane mats for resting animals. Each section is designed for 71 heads of simultaneous housing. Manure removal is hydraulic flush using a delta scraper.

¹ <https://www.spark-interfax.ru/stavropolski-krai-predgorny-raion/ooo-selo-im-g-v-kaisheva-inn-2618015500-ogrn-1032600263552-2056d879168e4acbb210f93d3e486174>



Figure 1. The territory of the complex of LLC Agrofirma " Village named after G. V. Kaishev"

The feeding is the same type all year round using homogenized feed mixtures. Diets are balanced in nutritional value and energy value. Distribution of feed is carried out using self-propelled mixer-feeders "SILOKING" (Germany) and "KUHN" (France), thanks to which effective management of feed stocks is carried out. An electronic weighing system, included as standard, ensures accurate control of the amount of food ingredients loaded and dispensed. At the same time, cows have free access to clean drinking water around the clock.

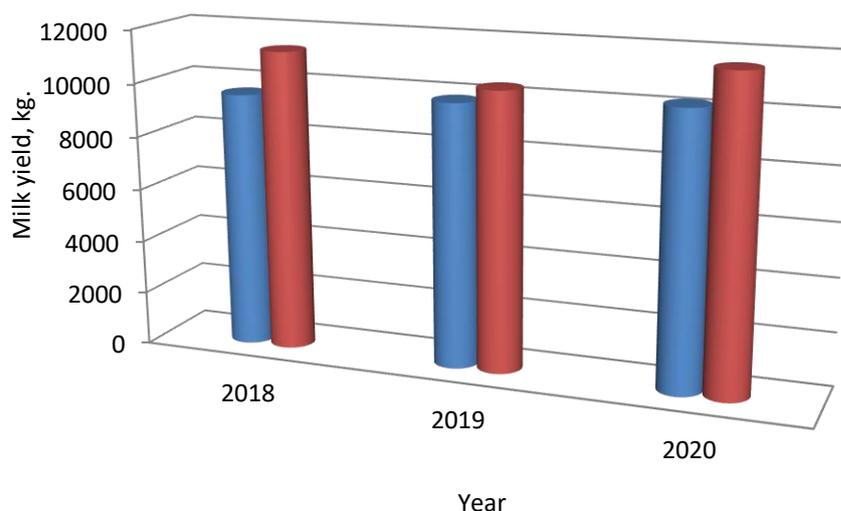
High-quality livestock, well-organized zootechnical work with the herd allowed the farm of LLC "Agrofirma" Village named after G.V. Kaishev" to obtain the status of a pedigree reproducer.

Outstanding cows-record holders are annually marked according to the results of grading. The presence of record-breaking cows in the herd is one of the indicators of the effective operation of the complex. They demonstrate the potential of the breed in specific phenotypic conditions (table 1). In 2017-2018 the excess of the productivity of record-breaking cows over the herd averages ranged from 28,4 to 39,6 %. In 2019, these were cows: Zhusi (line of the bull Vis Back Aydial 1013415) and Zhetske (line of the bull Reflection Sovering 198998), the productivity of which, in terms of the base milk fat content of 3,4%, exceeds the average indicators for the herd, respectively 84.3 and 73,6%. This "gap" is explained by the increase in milk yield of record-holders in 2019 from 14,5-15,0 thousand kg/head. up to 18,0 to 19,0 thousand kg/head.

Table 1. Cows-record-holders LLC "Agrofirma" Village named after G.V. Kaishev"

Year	Inv. number	Nickname	Line	Cow productivity in 365 days of lactation			In terms of basis fat
				Milk yield,	Fat, %	Protein, %	
2017	2155	Aleida 395	Vis Back Aydial 1013415	13305	3,8	3,13	14870,3
	2362	Tonnee	Vis Back Aydial 1013415	11893	4,15	3,25	14519,9
	Average for the herd in the current			9857	3,90	3,30	11306,6
2018	713	Teenie 48	Reflection Sovering	13265	3,80	3,25	14825,6
	9676	Piedgeb 242	Vis Back Aydial 1013415	13166	4,06	3,49	15721,8
	Average for the herd this year			9572	4,00	3,30	11261,2
2019	2294	Zhusi	Vis Back Aydial 1013415	14515	4,48	3,15	19125,6
	4104	Zhetske	Reflection Sovering	14480	4,23	3,28	18014,8
	Average for the herd this year			9825	3,59	3,31	10374,0

Dynamics of herd milk productivity in 2018-2020 demonstrates a positive trend (figure 2).



■ Actual milk yield, kg / head. ■ Milk yield in terms of basic fat content, kg / head.

Figure 2. Dynamics of milk productivity of cows LLC "Agrofirma" Village named after G.V. Kaishev"

Average annual milk yield for 2018-2020 amounted to 9871 kg/head actual fat content and 11067 kg/head base fat (3,4%). In 2019, the farm noted a slight decrease in the amount of milk of basic fat content, which is confirmed by data on the content of protein and fat (table 2).

Table 2. The content of fat and protein in the milk of cows LLC "Agrofirma" Village named after G.V. Kaishev"

Content, %	Study period		
	2018	2019	2020
Fat	4,00	3,59	3,85
Protein	3,30	3,31	3,34

In 2019, there was also a decrease in the mass fraction of fat in milk by 10,3% compared to 2018. However, the protein content in milk has a positive trend, which is a consequence of properly organized feeding and selection and breeding work.

For artificial insemination, the seed of the best breeding bulls of the Holstein breed of Canadian and American selection is used: Vis Back Aydial 1013415 and Reflection Sovering 198998. For breeding cows on the farm, one of the best practices is used - the use of genetic material, divided by sex, that is, sexed semen, during insemination. The advantage of using such a seed is an increase in the breeding stock, the output of heifers from sexed semen is from 90 to 98% with a high genetic potential. Analysis of reproduction indicators (table 3), in particular, the output of calves from 100 cows 83-84 heads in 2019-2020, compared with 76 heads in 2018 indicates effective work with the herd.

Table 3. Indicators of reproduction of the herd of LLC "Agrofirma" Village named after G.V. Kaishev"

Year	Calf yield from 100 cows, heads	Introduced into the herd of first-calf heifers, heads	Artificially inseminated cows and heifers			Duration of production use of cows, calving
			total, head.	including bulls-improvers		
				heads	%	
2018	76	344	1641	840	51,2	3,2
2019	83	475	1646	359	21,8	2,6
2020	84	597	1832	1236	67,4	2,8

In 2019-2020, a planned “cleaning” was carried out in the dairy herd, as a result, a large number of cows were culled within two years, and the maximum number of first-calf heifers was introduced into the herd: in 2019 - 475 heads, and in 2020 - 597 heads, which in 2019 adversely affected both the quantitative value of milk yield and the fat content in milk, since first-calf heifers reach maximum indicators only by 2-3 calving. For this reason, the period of economic use of cows has slightly decreased from 3.2 in 2018 to 2.8 calving in 2020.

Comfortable conditions have been created for milking cows: from the equipment of the milking parlor and the primary processing of milk from De Laval and high hygiene standards to the sounds of classical music that improve the milk flow process (figure 3).



Figure 3. Milking parlor of the dairy complex LLC "Agrofirma" Village named after G.V. Kaishev"

Immediately after receipt, milk is cooled to a temperature not exceeding 6 ° C and stored in an isothermal tank until it is sent for processing. On average, about 40 tons of milk of actual fat content (on average 3,81%) are supplied to Pyatigorsk Dairy Plant LLC per day, which makes it possible to obtain a variety of dairy products.

It is important that in LLC "Agrofirma" Village named after G.V. Kaishev" milk production is profitable (table 4). Over three years, the livestock of fodder cows increased slightly by 2,9%, while the volume of milk production increased by 10,7%, which is a direct consequence of the increase in the milk productivity of the herd. At the same time, maintenance costs increased by 34,4% and the cost of milk production increased by 26,9%.

As a result, profit fell by 13,5%, and profitability dropped to 10%. However, such a decrease is a temporary phenomenon, since at the expense of the funds from the profit, the enterprise purchased new houses for keeping the young, which in the future will help to increase its safety.

Table 4. Economic efficiency of milk production in LLC "Agrofirma" Village named after G.V. Kaishev"

Indicator	2018	2019	2020	2020 in% to 2018
Livestock of forage cows, head.	1138	1138	1171	102,9
including dairy cows, head.	1072	1088	1079	100,7
Maintenance costs, thousand rubles	267505	283636	359430	134,4
Milk production volume, t	10883,6	11842,9	12045,2	110,7
Sales proceeds, thousand rubles	276719	322162	339727	122,8
Cost of milk production, thousand rubles	241424	219507	306207	126,9
Profit, thousand rubles	35295	102655	30520	86,5
Profitability,%	14,6	46,7	10,0	

In the near future, LLC Agrofirma Village named after G.V. Kaishev plans to build another production building for 2660 heads and increase the number of dairy herds from 1200 to 3860 heads, which will increase the share of its own raw materials to 50% (200 tons of milk) the daily processing volume of "Pyatigorsk Dairy Plant" LLC.

Conclusion

The key to obtaining high milk productivity and milk quality is optimal conditions for keeping, feeding and milking animals. Well-organized zootechnical and veterinary work with the herd, a sufficient level of feeding is ensured in LLC "Agrofirma" Village named after G.V. Kaishev" milk yield 9870,6 (on average for three years) with a fat content of 3,81% and protein 3,32 %.

The successful work of the agroholding LLC "Agrofirma "Village named after G. V. Kaishev" served as an example for the creation of another association of milk producers and

processors in the region – LLC "Kazminsky Dairy Plant". The annual milk production is more than 13,800 tons².

Such a quantity of high-quality milk is a serious contribution to ensuring the processing capacities of "Pyatigorsk Dairy Plant" LLC and solving the problem of food security in the KMV region.

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² <https://www.spark-interfax.ru/stavropolski-krai-predgorny-raion/ooo-selo-im-g-v-kaisheva-inn-2618015500-ogrn-1032600263552-2056d879168e4acbb210f93d3e486174>