

Assessment of the effectiveness of black-and-white cattle breeding in the regional aspect

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Abstract. The modern structure of cattle breeding is largely determined by the level of realization of the productive potential of dairy cattle breeds. Most of the dairy herd of the country is represented by black-and-white cattle. Due to the scale of the territory of the Russian Federation and the wide variety of its natural and economic conditions, each region of the country has its own indicators of the dairy herd development. In this regard, we conducted a comparative assessment of the complex of indicators for the effectiveness of the use of black-and-white cows in the conditions of their maintenance in Russia, as well as in the Volga Federal District, the Republic of Bashkortostan and at a specific enterprise Kalinin AP LLC.

1 Introduction

The Volga Federal District is one of the most significant subjects in the agricultural sector of the Russian Federation economy. In terms of livestock production, it occupies a leading position in Russia. The main branch of animal husbandry is dairy and meat cattle breeding, but pig and poultry farming are also well developed. The Volga region is the undisputed leader in Russia in the number of cattle - more than 5 million heads (29% of the total livestock), in terms of milk production (9.9 million tons) and the production of livestock and poultry for slaughter in slaughter weight (102 thousand tons).

In addition, the Volga Federal District is one of the few regions of the country where milk consumption is fully covered by its own production. Moreover, production exceeds consumption by 28%. In this regard, the average consumption per capita in 2020 in the region amounted to 302 kg per person per year at the recommended rate of 325 kg, while the national average is 240 kg [7].

The Republic of Bashkortostan is one of the leaders in terms of production indicators in Russia and in 2020 took 2nd place – 1.7 million tons per year (after the Republic of Tatarstan) in terms of milk production and 2nd place in terms of cattle.

Despite its leading position in the ranking of the largest raw milk producers in the regions, it is only on the 6th position in terms of the amount of market milk. With an annual production of 1,650 thousand tons of milk, only 750 thousand tons (45%) remain sold.

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The key problem of the region is the sector fragmentation and a large number of small farms, which, on the one hand, are poorly managed by the regional authorities, and on the other hand, they do not have financial and human resources for intensive development, but carry a social function.

Currently, 70% of the dairy herd of the Republic of Bashkortostan is represented by a black-and-white breed. In the region, 163 farms are engaged in breeding animals of this breed. The top five of them in terms of gross milk production includes the breeding enterprise Kalinin AP LLC of the Sterlitamak district, which contains 7770 heads of black-and-white cattle, including 1884 cows.

Depending on the territorial location and housing conditions, dairy cattle exhibit their characteristics in different ways [1]. The purpose of the study is a comparative assessment of the general management and economic indicators of black-and-white cattle breeding in keeping conditions in the Volga Federal District and the Republic of Bashkortostan and private indicators - in the economy of Kalinin AP LLC in the dynamics of recent years.

2 Materials and methods of research

The theoretical and methodological basis of the research was the works of modern domestic and foreign scientists of agricultural economists, the current legislative acts of the Russian Federation, regulatory documents of the Republic of Bashkortostan, as well as program documents and resolutions of the government, the Ministry of Agriculture of the Russian Federation and the Republic of Bashkortostan on the agriculture development, statistical data of Kalinin AP LLC.

The following research methods are used in the work: economic-statistical, computational-constructive, economic-mathematical, analytical.

3 Results and Discussion

The black-and-white cattle breed was bred in the USSR in the 1930–40s as a result of crossing bulls imported from Holland with cows of local breeds. Also, black-and-white cattle were imported from Germany and the Baltic States in 1930–1932. The breed was approved in 1959. By the end of the 1970s, its livestock exceeded 10 million heads.

The black-and-white breed of cows is characterized by a dense physique. The main direction of animals is dairy, but meat traits are no worse developed. Cattle is characterized by earliness. The crossing of a heifer with a bull occurs at an early age — 1.2–1.4 years. Animals are distinguished by good endurance and strong immunity. They acclimatize easily and are resistant to cold [8].

Currently, it is the most common breed in the world. In the Russian Federation, its share in the total number of livestock is 48%. According to the appraising data on the territory of the Volga Federal District and the Republic of Bashkiria in the structure of the breed composition, animals of the black-and-white breed occupy 70%.

Black-and-white cattle are valued for their productive qualities. In 2020, the average annual milk yield from a cow in the country amounted to 7558 kg, this is the indicator of the 5th place in productivity of all breeds bred in Russia [2].

The positive dynamics of the annual growth of milk yields can be traced both in the country as a whole, and in the Volga Federal District, the Republic of Bashkortostan, and in Kalinin AP LLC (Table 1). Over three years, the productivity of animals has increased by 10.3%, 11.4%, 7%, and 19%, respectively. The smallest amount of milk being milked (5955 kg/year) and a low rate of productivity growth are in cows bred in the Republic of Bashkortostan.

The current situation in this region is caused by a high proportion of personal subsidiary farms of the population on its territory, which do not have the fodder, technical, and financial ability to affect the productive characteristics of the herd. Despite this, the region can be considered favorable for breeding black-and-white cattle by its climatic and socio-economic conditions. It is necessary to pay more attention to the development of the sector of agricultural organizations and breeding enterprises. According to statistical data, the productivity of black-and-white cows at animal breeding enterprises in the Republic averages 7378 kg/year.

The breeding of cattle of the breed in question at the Kalinin AP LLC in the dynamics of years shows high growth rates of milk yield in cows. In 2020, the productivity of cows at the enterprise was 7465 kg/year, was close to the value of the national indicator, and significantly exceeded the average values for the Volga region and the Republic of Bashkortostan.

According to the qualitative composition of the milk being milked, the farm also has a clear advantage. The average fat content in milk is 3.95%, protein – 3.3%, which exceeds the indicators for all the territorial subjects under consideration (+0.06% and +0.1% compared to the average in Russia).

Table 1. Dynamics of milk productivity of black-and-white cows

	Milk yield, kg	Fat content, %	Protein content, %
	2018		
Russian Federation	6853	3.87	3.14
Volga Federal District	6471	3.86	3.14
Republic of Bashkortostan	5567	3.86	3.1
Kalinin AP LLC	6245	3.97	3.3
	2019		
Russian Federation	7177	3.89	3.17
Volga Federal District	6840	3.86	3.14
Republic of Bashkortostan	5659	3.86	3.12
Kalinin AP LLC	7298	3.95	3.3
	2020		
Russian Federation	7558	3.89	3.2
Volga Federal District	7209	3.87	3.18
Republic of Bashkortostan	5955	3.87	3.12
Kalinin AP LLC	7465	3.95	3.3

A comparative analysis of the economic activity of the enterprise under study showed high values for the main indicators of the black-and-white cattle use (Table 2). In 2020, at Kalinin AP LLC, the age of the first calving of a cow had the lowest value (797 days) at the level of the national average (799 days). The animals bred in the Republic of Bashkortostan reached the highest age at the first calving.

The duration of the period of dairy cow use is of high importance for dairy cattle breeding. According to research, animals with a long period of economic use give more milk and

require less costs for their breeding per year of life [4, 6]. In the Republic of Bashkortostan, of all the subjects, the dairy herd had the longest period of productive longevity and reached 4 lactations. On average in the Russian Federation, this indicator does not exceed the value of 3.3 lactations.

Over the past three years, the life span of all the subjects studied has decreased. This trend is characteristic of the entire livestock of cattle bred throughout Russia: the annual milk yields of cows are increasing, and their service life is shortening.

Indicators of lifetime milk yield among all the subjects under consideration on average in recent years have the lowest values in the Volga Federal District. Until 2019, according to this productivity indicator, Kalinin AP LLC was in the lead with the highest milk yield value of 22.6 thousand kg of milk for the entire productive life of a cow.

Table 2. Dynamics of economic indicators of use of black-and-white breed cows

Regions	Age		Duration of lactation, days	Lifetime yield, thousand kg
	at 1 calving, days	cows withdrawal, calving		
2018				
Russian Federation	822	3.36	358	19
Volga Federal District	827	3.54	351	18.9
Republic of Bashkortostan	852	4.32	330	20
Kalinin AP LLC	804	4.01	338	20.8
2019				
Russian Federation	808	3.16	357	18.1
Volga Federal District	811	3.14	352	16.9
Republic of Bashkortostan	840	4.25	328	19.8
Kalinin AP LLC	818	3.65	356	22.6
2020				
Russian Federation	799	3.3	358	20.4
Volga Federal District	805	3.4	354	20.1
Republic of Bashkortostan	837	3.98	332	19.3
Kalinin AP LLC	797	3.39	342	20

The productivity potential of dairy cattle in the country continues to increase. Nevertheless, the problem of reproduction becomes more acute with increasing productivity and makes it difficult to replace the herd, even with simple reproduction. The economic indicators of dairy cattle breeding, the nature of breeding work, the duration and intensity of livestock use, and, as a result, the development of the industry as a whole directly depend on the level at which the herd replacement is located [3].

According to the assessment of reproductive qualities, in the regional aspect, the best characteristics are observed in cows bred in the Republic of Bashkortostan and in Kalinin AP LLC. The yield of calves here per 100 cows is 91 and 97 heads, respectively. The calving

interval in cows bred in the Republic has the lowest value among all – 393 days in 2020 (Table 3).

Table 3. Dynamics of reproduction indicators of black-and-white cows

	Calf crop per 100 cows	Calving period, days	Duration, days		Heifers received per 1 cow, head
			service-period	interlactation period	
2018					
Russian Federation	80.4	418	133	60	0.91
Volga Federal District	83.2	412	127	61	0.96
Republic of Bashkortostan	91.1	391	106	61	1.17
Kalinin AP LLC	93.7	404	119	66	1.08
2019					
Russian Federation	80.5	417	132	60	0.82
Volga Federal District	82.7	412	127	60	0.81
Republic of Bashkortostan	91.5	389	104	61	1.10
Kalinin AP LLC	97.1	414	129	58	0.95
2020					
Russian Federation	80.6	418	133	60	1.08
Volga Federal District	82.9	414	129	60	1.11
Republic of Bashkortostan	91.0	393	108	61	1.30
Kalinin AP LLC	97.5	402	117	60	1.11

The indicators of the service period in the Republic of Bashkortostan and in the economy are lower than the average for the country and the district, where the service period reaches 130 days or more. According to scientists' research, excessively long service periods not only reduce the gross yield of each cow over a number of years, but also significantly reduce the level of dairy productivity of the herd as early as next year, and lead to a shortage of young animals [5].

Having the data of economic activity results on the breeding of black-and-white cattle in the regional aspect, we were able to calculate the volume of livestock production per year in value terms (Fig. 1). In the course of the analysis, we considered the quantitative and qualitative characteristics of milk produced, the number of heifers that the cow gives and the beef yield.

The totality of these indicators, expressed in ruble equivalent, showed that the animals kept in the conditions of Kalinin AP LLC have a higher output, and therefore a higher income. In 2020, the production of livestock products on the farm amounted to 138,737 rubles per cow.

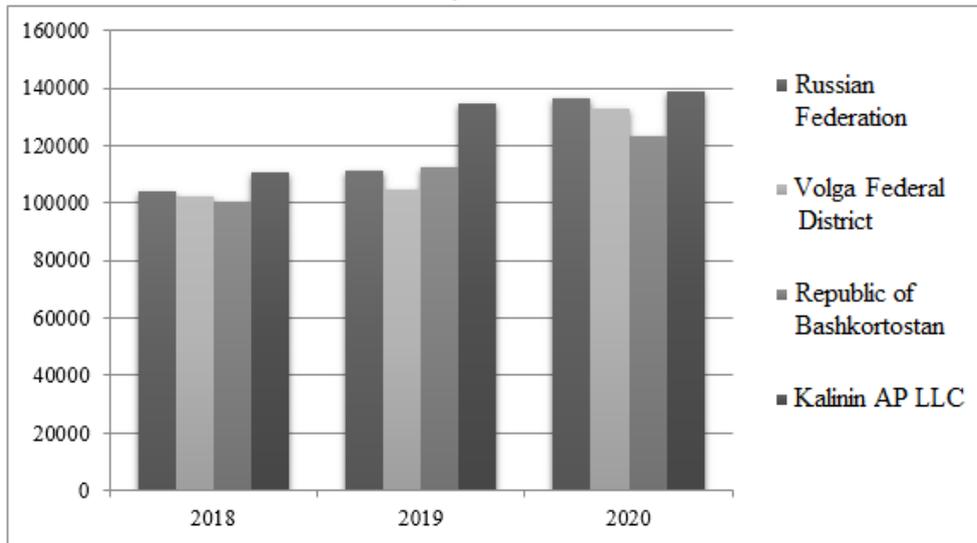


Fig. 1. Dynamics of production per the year of animal's life in value terms, rub.

In the Republic of Bashkortostan, this indicator reaches the lowest value of all subjects. The production volume here in 2020 was 12% lower than the indicator in the economy and 10% lower than the all-Russian one.

4 Conclusions

The analysis showed that the animals of the black-and-white breed in the Volga region show high rates of their use compared to the whole Russia and annually improve their performance. The lowest characteristics are observed in the Republic of Bashkortostan, mainly due to the high proportion of households in the total volume of milk produced.

But an increase in the number of agricultural and, in particular, breeding organizations with favorable conditions for feeding and keeping cattle in this region can significantly increase the management and economic efficiency of its breeding [9, 10, 12], as, for example, at the breeding enterprise Kalinin AP LLC.

The assessment of management and economic indicators of the black-and-white cattle in the farm showed that in comparison with the country and regional values, the enterprise has high competitive advantages. It shows good characteristics in terms of quantitative and qualitative characteristics of milk being milked, in terms of productive longevity and reproduction.

The development of modern, competitive animal husbandry is impossible without the creation of a solid breeding base. The need to increase breeding resources is due to the strategic tasks facing dairy cattle breeding in Russia in the near future for import substitution in the domestic market for the main types of mass-demand dairy products [11].

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