Key words: *lactation period, milk fat, milk protein, lactation curve, crossover.*

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THE QUALITY AND COMPOSITION OF FEED AND ITS EFFECT ON MILK PRODUCTIVITY OF KAZAKH WHITE-HEADED CATTLE RAISED IN THE «KASHYM» FARM IN ABAI DISTRICT, ABAI REGION

Abstract: *This article examines the quality and composition of feed provided to Kazakh white-headed cattle raised at the «Kashym» farm in Abai District, East Kazakhstan Region. During the study, the main types of feed used on the farm—alfalfa, clover, smooth brome, and grain crops—were analyzed in terms of their nutritional value and quality indicators. The organoleptic properties of the feed (color, smell, moisture) were assessed, and their suitability for livestock was evaluated. In addition, under laboratory conditions, the chemical composition of the feed (water, protein, fat, fiber, nitrogen-free extractive substances, and ash) was determined and comparatively analyzed.*

The research results showed that leguminous feeds (alfalfa and clover) contain higher levels of protein and minerals, which positively affect cattle productivity. The effect of different feed types included in the diet on milk productivity was studied, and an increase in milk fat content and protein levels was observed in the experimental group.

Based on the study, it was concluded that the feed used at the «Kashym» farm is of high quality and nutritionally balanced. It was also determined that optimizing the diet can further improve livestock productivity.

Keywords: *cattle, Kazakh white-headed breed, feed quality, diet, protein, milk productivity, feeding.*

Introduction

Increasing the production of beef and improving its quality makes beef cattle farming a particularly important sector. It is a specialized branch of livestock production that allows for the rapid replenishment of the country's meat resources.

Currently, in the East Kazakhstan region, the number of farms engaged in breeding Kazakh white-headed beef cattle is growing. One such farm is the «Kashym» farm located in Abai District. The main goal of this farm is to improve and develop the quality of purebred herds of Kazakh white-headed cattle.

A distinctive feature of Kazakh white-headed cattle is their wide distribution across all regions of the Republic of Kazakhstan—from east to west and from south to north. This is because they are highly resistant to both heat and cold and are not demanding in terms of feed. During the summer and autumn periods, regardless of weather conditions, they graze well and enter the winter season in good condition [1-3].

One of the most important factors affecting the quality of livestock products is feeding. Feed refers to plant-, animal-, and microbe-derived substances that are well consumed and digested by animals without harming their health, productivity, or product quality. In animal nutrition, various mineral, vitamin, and enzyme supplements produced by industry are widely used.

A sufficient supply of high-quality feed is the main condition for the development of livestock farming. The animal's body obtains the substances necessary for its жизнедеятельность from the surrounding environment, which requires an adequate concentration of nutrients in the ration. Proper feeding, obtaining high productivity, and increasing livestock numbers require a well-established feed base that provides all essential nutrients. For example, proper feeding improves animal health, ensures normal reproduction, preserves livestock populations, and enhances their development and productivity [4-6].

The energy, nutrients, and biologically active substances necessary for the animal's жизнедеятельность are supplied through the daily intake of feed. Therefore, ensuring an adequate supply of all components required for proper metabolism depends directly on the quantity and quality of feed provided. Feed quality is primarily determined by its chemical composition, richness in nutrients, and digestibility.

Before and during feeding, it is necessary to determine and monitor the quality of feed prepared on the farm. This is because feed prepared early and stored for a long time may lose quality and provide limited benefit to animals. However, individual farm owners often do not conduct laboratory analyses to determine the nutritional value and quality of feed. Instead, they typically rely on visual assessment—judging by smell, color, appearance, and how willingly animals consume it.

Among perennial cereal grasses cultivated in steppe regions characterized by frequent droughts and relatively harsh winters, smooth brome occupies a leading position [7-10].

The main condition for efficient livestock farming is the proper organization of the feed base and feeding practices that ensure maximum productivity of each animal while minimizing feed costs and obtaining high-quality products.

Materials and Methods

In this study, zootechnical analysis was carried out to examine the composition of feed provided to Kazakh white-headed cattle at the «Kashym» farm in Abai District. First, the types of feed used for feeding the cattle on the farm were identified. The main feed types included alfalfa, clover, smooth brome, and barley bran.

For the research, feed samples were taken from the farm's feed reserves. Their chemical composition was analyzed, and quality was assessed in the «Shakarim Lab» laboratory of «Shakarim University» (Figure 1). After the average samples of the feed were delivered to the laboratory, the collected feeds were evaluated organoleptically in accordance with GOST 4808-87 standards, as shown in Table 1.

Table 1 – Types and quality of feed in the «Kashym» farm

№ Types of feed	Botanical description	Evaluation			
		Color	Odor	moisture	Conclusion on feed quality
1 Alfalfa (Lucerne)	A herbaceous legume plant, annua or perennial, with a branched bushy stem 40–80 cm tall. It has trifoliate elongated leaves, clustered flowers and multi-seeded pods.	light green	characteristic odor,no foreign smell	15%	Grade I (suitable for livestock feed) Contains no poisonous plants in its composition.

Table 1 – continue

2 Clover	A perennial or annual herbaceous legume plant 15–50 cm tall with a round stem, thick root, compound leaves, clustered small flowers, and pods containing 1–6 seeds.	light green	characteristic odor,no foreign smell	17%	Grade I (suitable for livestock feed) Contains no poisonous plants in its composition
3 Crested wheatgrass	A perennial grass-family herbaceous plant 25–70 cm tall with narrow leaves, hairy flowers in spike inflorescences, and oval grain fruits It blooms in June and fruits in July.	light green	characteristic odor,no foreign smell	16 %	Grade I (suitable for livestock feed) Contains no poisonous plants in its composition.
4 Wheat flou	An important cereal plant of the grass family with a spindle-shaped spike and elongated smooth grains The spike may be white, reddish, or black, often with awns.	Light yellow	No foreign smell	15%	Grade I (suitable for livestock feed) Contains no poisonous insects or toxic substances.

According to Table 1, during the organoleptic evaluation of feeds, first of all, the type of feed was determined based on its botanical composition. The color was assessed visually, the smell was evaluated to detect any moldy or spoiled odors, and the moisture content was determined in the laboratory by drying samples in a drying oven and applying a specific formula. Based on these indicators, the feeds were classified as Class I. In our study, the feeds were assessed as high quality and suitable for consumption. The coarse feed types meet zootechnical requirements.

Figure 1 – Determination of feed quality in the laboratory

Livestock are fed with various types of feed, and their nutritional and biological value is determined by the chemical substances included in their composition.Water is present in all types of feed in amounts ranging from 5% to 95%. The water content is determined by drying the sample (the exact amount of feed taken for chemical analysis) at a temperature of 100–105°C until a constant weight is achieved. The higher the water content in feed, the lower its nutritional value and quality [5, 9].These elements are part of chemical compounds in the organism. They are first divided into water and dry matter, while dry matter is further divided into organic and inorganic (mineral) substances. After evaluating the main types of feed on the farm, we studied their chemical composition (alfalfa, clover,

brome grass, wheat). The zootechnical analysis of these feeds was carried out in accordance with the standard GOST RK R 50817-2008.

Table 2 – Chemical composition of feeds, %

№	Types of feed	Water	Protein	Fat precentage	Core	Non-nitrogenous extractive substances	Ash
1	Alfalfa (Lucerne)	15	15,1	2,4	25,6	33,4	8,5
2	Clover	17	12,6	2,6	24,4	36,3	7,0
3	Crested wheatgrass	16	5,1	1,1	15,4	18,2	3,6
4	Wheat flou	15	4,5	1,6	36,7	36,8	5,4

In Table 2, according to the chemical composition of feeds, the types of feed given to Kazakh white-headed cattle in the «Kashym» farm include alfalfa and clover. The ash content in these legumes is 8.5% and 7.0%, respectively. This shows that leguminous plants contain more minerals, especially calcium, compared to cereal crops. Feeds with different chemical compositions and nutritional values must be consumed, digested, and absorbed by the body. Only then can they be converted into energy and essential nutrients in the organism. The chemical composition of feeds is comparatively shown in Figure 2.

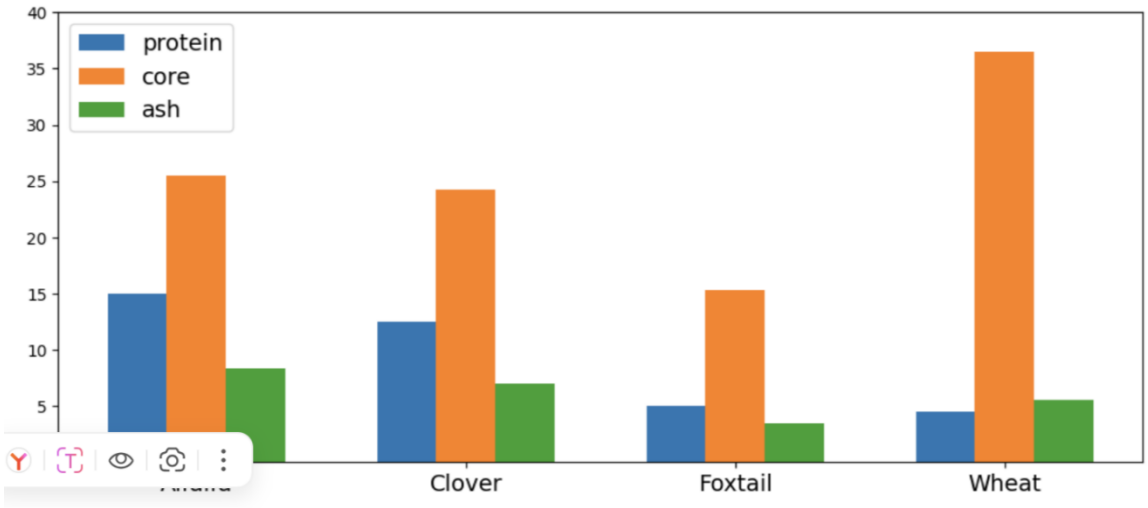


Figure 2 – Chemical composition of feeds

Feed intake and digestion are closely interconnected. A high fiber content and increased bulk reduce feed digestibility and limit intake. This is because bulky roughage passes more slowly through the digestive tract, which prolongs the digestion period. Therefore, legumes such as alfalfa and clover, which have higher digestibility, contain less fiber (25.6–24.4%) compared to cereal crops like crested wheatgrass and wheat. As a result, such feeds are consumed in greater amounts.

According to the results of the analysis of the chemical composition of feeds at the «Kashym» farm, the quality of the feeds provided to cattle is considered nutritionally complete in the ration.

Different types of feeds must be calculated in specific proportions. The percentage ratio of these feeds according to their overall nutritional value is called the ration structure. The feeding type of livestock in a farm depends on the main feed type in the ration structure. It is influenced by the available forage resources, commonly grown feed crops in the region, and the efficiency of their use in animal feeding (Figure 3).

Figure 3 – Experimental animal group

In our study, a ration was formulated for the experimental and control groups of Kazakh white-headed cattle at the «Kashym» farm in East Kazakhstan region to determine the effect of changing the feeding ration on animal productivity, especially milk yield. Each group consisted of 10 cows.

During the study, all animals were clinically healthy and kept under identical conditions. The cows were fed once a day. The control group ration consisted of alfalfa, clover, crested wheatgrass, and barley bran. The experimental group received the same feeds, but instead of barley bran, wheat flour and sunflower meal were used.The total nutritional value of the rations in both groups met the recommended standards, and the levels of essential nutrients were maintained within the normal range (Table 3).

Table 3 – Feeding ration for cows with calves weighing 500 kg live weight (control group)
Milk production in cows primarily depends on proper feeding. It is known that more than 500

Feeds and supplements	Amount, kg	Nutrients and mineral elements											
		Feed unit	Metabolizable energy, MJ	Dry matter, g	Digestible protein, g	Crude fiber, g	Sugar,g	Ca, g	P, g	Solt, g	Copper, g	Zinc, g	Co, g
Feed standard		9	106	13000	1395	3690	666	68	38	60	104	486	65
Clover	4	2,08	25,42	2820	362	526	100	36,8	8,8		21,1	113,1	0,8
Foxtail grass	9	4,5	60,66	6402	574	2502	144	45	19,8		69	235,3	9
Alfalfa	4,5	1,98	30,24	3735	454,5	1138,5	121	76,5	9,9		13,5	109,1	0,9
Barley bran	0,4	0,46	0,2	340	34	19,6	18,8	0,8	3,84		1,68	14,4	0,04
Cobalt sulfate	0,1												48,3
Feed beet molasses	0,5	0,38	4,68	400	30	-	271,5	1,6	0,15		2,3	10,4	0,185
Total:	18,5	9,04	121,2	13782	1371	3573,6	634,3	121	41,39	+	115,2	486,3	59,125
Balance ±	+	+0,04	+15,2	+477	−33	−116,4	−31,7	+53	+3,39	+	+11,2	+0,3	-5,8

Liters of blood pass through the udder for the production of one liter of milk. The blood must supply all the necessary nutrients and compounds required for milk synthesis. Digested nutrients from the digestive tract are absorbed into the blood. Therefore, to ensure milk formation, cows must be fed a well-balanced and complete ration that provides all essential nutrients in sufficient amounts [6,7]. To increase milk yield, after calving, cows are first fed a ration including alfalfa and silage, along with steamed bran. After 3–4 days, they are gradually switched to the usual feed ration. Then, the amount of forage in the ration is gradually increased each day, while monitoring both the quantity and quality of milk produced. If increasing the feed does not improve milk yield within 2–3 days, the amount of feed is gradually reduced to the optimal level. It is recommended to start feeding cows a full and nutrient-rich ration about 2 months before calving. Milk fat content is an important selection trait when evaluating milk production. The higher the fat content of milk, the higher its nutritional value and the lower its production cost (Table 4) [3].

Table 4 – Feeding ration for cows with calves weighing 500 kg live weight (experimental group)

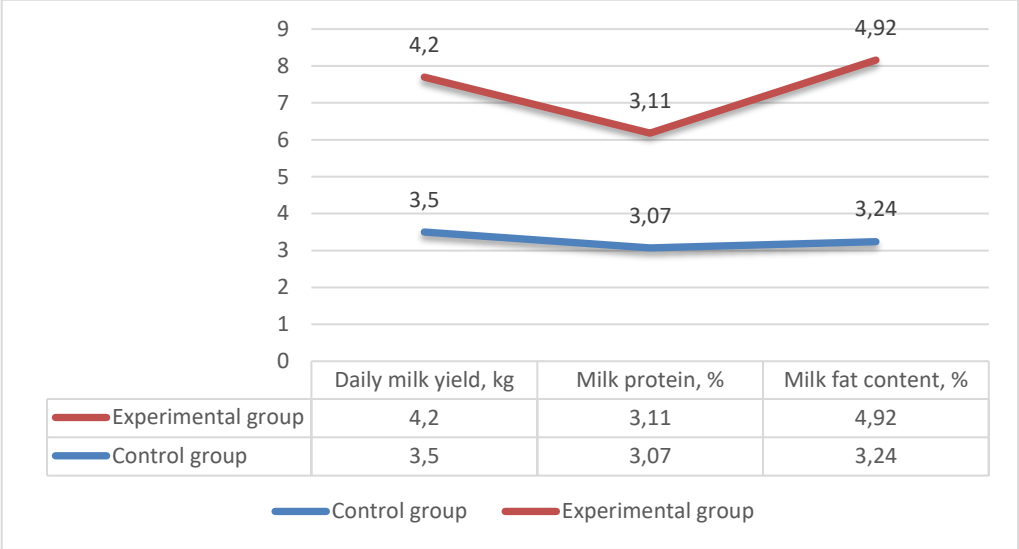
Feeds and supplements	Amount, kg	Nutrients and mineral elements												
		Feed unit	Metabolizable energy, MJ	Dry matter, g	Digestible protein, g	Crude fiber, g	Sugar,g	Ca, g	P, g	Solt, g	Copper, g	Zinc, g	Co, g	Carotene, g
Feed standard		9	106	13000	1395	3690	666	68	38	60	104	486	65	350
Clover	4	2,08	25,42	2820	362	526	100	36,8	8,8		21,1	113,1	0,8	100
Foxtail grass	9	4,5	61,2	6402	387	2511	144	45	19,8	-	69	235,3	9	135
Alfalfa	4,5	1,98	30,24	3735	454,5	1138,5	121	76,5	9,9		13,5	109,1	0,9	105
Wheat flour	0,2	0,094	1,77	166	22,6	53	5,2	1,52	0,5	-	0,408	3,42	0,042	4,2
Sunflower cake	0,2	0,21	1,52	162,4	18,4	47,6	12,52	14,5	0,48	-	0,56	14,4	0,002	2
Feed beet molasses	0,5	0,38	4,68	400	30	-	301,5	1,6	0,15	-	2,3	10,4	0,185	-
Cobalt sulfate	0,1												48,3	
Total:	18,5	9,2	125	13685	1275	4276,1	651,7	136,2	38,5	+	116,4	489,7	59,1	341,2
Balance ±	$^{+}$	+0,2	$^{+}$25	$^{+}$685	$^{-}$120	$^{-}$35,4	-14,3	$^{+}$68,2	$^{+}$0,5	+	$^{+}$10,4	$^{+}$3,7	-5,9	-8,8

The main indicator affecting the growth and development of offspring is the milk yield and nutritional quality of the cow. Before calves begin consuming solid feed, they are nourished with their mother's milk, and their development depends directly on its quantity and quality. Therefore, we studied the effect of the given feed on milk production (Table 5). During the experiment, various parameters of daily milk yield were analyzed in both experimental and control groups of cows.

Table 5 – Effect of feed on cow milk yield and milk composition.

Indicators	Control group	Experimental group
Daily milk yield, kg	3,5	4,2
Milk protein, %	3,07	3,11
Milk fat content, %	3,24	4,92

We analyzed the composition of milk using the Klever-2M apparatus at the «Agrotechnopark» complex affiliated with «Shakarim State University of Semey» in the city of Semey. Adding wheat flour and sunflower cake to the cows' diet also had a positive effect on milk quality in our studies. In particular, as shown in Figure 4 the fat content of the milk in the experimental group increased by 1.68%, while the protein content increased by 0.04%.



	Daily milk yield, kg	Milk protein, %	Milk fat content, %
Experimental group	4,2	3,11	4,92
Control group	3,5	3,07	3,24

Figure 4 – Effect of the ration on daily milk yield and milk composition

Results

The results of the conducted research demonstrated that the quality and nutritional value of the feeds provided to Kazakh White-Headed cattle at the «Kashym» Farm were at a high level. During the organoleptic evaluation of feed types (color, odor, and moisture content), all studied samples were classified as Class I, meaning they were fully suitable for feeding livestock and contained no foreign odors or toxic components.

The analysis of the chemical composition of the feeds revealed that leguminous forages — alfalfa and clover — were rich in protein (15.1% and 12.6%) and minerals (ash content of 8.5% and 7.0%). In contrast, cereal feeds (foxtail grass and wheat) contained relatively lower amounts of protein (5.1% and 4.5%), but had a higher proportion of carbohydrates (nitrogen-free extractive substances). These indicators characterize the biological value and digestibility features of the feeds.The analysis of the ration structure showed that the feeding levels in both the experimental and control groups met the recommended standards for the main nutrients. However, the inclusion of wheat flour and sunflower cake in the ration of the experimental group improved the efficiency of digestible protein and energy utilization.A comparative assessment of the cows' productivity indicators revealed positive changes in the experimental group. In particular, daily milk yield increased from 3.5 kg to 4.2 kg, showing an increase of nearly 20%. In addition, the main indicators of milk quality also improved: milk fat content increased from 3.24% to 4.92% (an increase of 1.68%), while protein content rose from 3.07% to 3.11%.The obtained results prove that balancing the ration and introducing feeds with high nutritional value (especially protein-rich components) have a direct positive effect on milk productivity and milk quality in cattle.

Overall, the study findings showed that the feeding system used at «Kashym» Farm is scientifically grounded and effective. Furthermore, it was determined that optimizing the ration provides significant opportunities to increase livestock productivity and improve the quality of the resulting products.

Conclusion

The results of the conducted scientific research demonstrated that the quality indicators of the feeds provided to Kazakh White-Headed cattle at the «Kashym» Farm in Abai District were at a high level and fully complied with zootechnical requirements. The organoleptic and chemical analyses of the feeds showed that their nutritional value was sufficient and biologically effective. In particular, the high content of protein and mineral elements in leguminous feeds alfalfa and clover allows them to be

considered essential and important components of the livestock ration.During the study, it was determined that changes introduced into the ration structure, specifically the addition of wheat flour and sunflower cake, had a positive effect on the productivity indicators of the cows. The increase in daily milk yield in the experimental group, as well as the rise in milk fat and protein content, confirms the biological effectiveness of balanced and complete feeding.In conclusion, the study results demonstrated that the feeding system used at «Kashym» Farm is scientifically grounded and effectively organized in accordance with zootechnical requirements. Furthermore, it was scientifically proven that balanced optimization of the ration composition, particularly through the accurate regulation of nutrients and biologically active substances, provides significant opportunities to improve cattle productivity and enhance the quality characteristics of the resulting products.

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АБАЙ ОБЛЫСЫ АБАЙ АУДАНЫНДАҒЫ «ҚАШЫМ» ШАРУА ҚОЖАЛЫҒЫНДА ӨСІРІЛЕТІН ҚАЗАҚТЫҢ АҚБАС ТҰҚЫМЫНА ЖАТАТЫН ІРІ ҚАРА МАЛДАРЫНА БЕРІЛЕТІН АЗЫҚТАРДЫҢ САПАСЫ МЕН ҚҰРАМЫ ЖӘНЕ СҮТ ӨНІМДІЛІГІНЕ ӘСЕРІ

Бұл мақалада Шығыс Қазақстан облысы Абай ауданындағы «Қашым» шаруа қожалығында өсірілетін қазақтың ақбас тұқымына жататын ірі қара малдарға берілетін азықтардың сапасы мен құрамы зерттелді. Зерттеу барысында шаруашылықта қолданылатын негізгі азық түрлері – жоңышқа, беде, еркекшөп және астық өнімдерінің қоректік құндылығы мен сапалық көрсеткіштері талданды. Азықтардың органолептикалық қасиеттері (түсі, иісі, ылғалдылығы) анықталып, олардың малға жарамдылығы бағаланды. Сонымен қатар, зертханалық жағдайда азықтардың химиялық құрамы (су, протеин, май, өзек, азотсыз экстрактивті заттар, күл) анықталып, салыстырмалы түрде бағаланды.

Зерттеу нәтижелері көрсеткендей, бұршақ тұқымдас азықтар (жоңышқа, беде) құрамында протеин мен минералды заттардың мөлшері жоғары болып, ірі қара малдың өнімділігіне оң әсер ететіні анықталды. Рацион құрамына енгізілген әртүрлі азықтардың сүт өнімділігіне әсері зерттеліп, тәжірибелік топта сүттің майлылығы мен белок мөлшерінің артқаны байқалды.

Зерттеу қорытындысы бойынша, «Қашым» шаруа қожалығында қолданылатын азықтар сапалы және толыққұнды екені дәлелденді. Сонымен қатар, рационды оңтайландыру арқылы мал өнімділігін арттыруға болатыны анықталды.

Түйінді сөздер: *ірі қара мал, қазақтың ақбас тұқымы, азық сапасы, рацион, протеин, сүт өнімділігі, азықтандыру.*

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КАЧЕСТВО И СОСТАВ КОРМОВ, ПРИМЕНЯЕМЫХ ДЛЯ КАЗАХСКОГО БЕЛОГОЛОВОГО КРУПНОГО РОГАТОГО СКОТА, ВЫРАЩИВАЕМОГО В КРЕСТЬЯНСКОМ ХОЗЯЙСТВЕ «КАШЫМ» АБАЙСКОГО РАЙОНА ОБЛАСТИ АБАЙ, И ИХ ВЛИЯНИЕ НА МОЛОЧНУЮ ПРОДУКТИВНОСТЬ

В данной статье исследованы качество и состав кормов, используемых для кормления крупного рогатого скота казахской белоголовой породы, выращиваемого в крестьянском хозяйстве «Кашым» Абайского района. В ходе исследования были проанализированы питательная ценность и качественные показатели основных видов кормов, применяемых в хозяйстве, — люцерны, клевера, житняк и зерновых культур. Были определены органолептические свойства кормов (цвет, запах, влажность) и оценена их пригодность для кормления животных. Кроме того, в лабораторных условиях был определён химический состав кормов (вода, протеин, жир, клетчатка, азотсодержащие экстрактивные вещества, зола) и проведена их сравнительная оценка. Результаты исследования показали, что бобовые корма (люцерна и клевер) содержат высокое количество протеина и минеральных веществ, что положительно влияет на продуктивность крупного рогатого скота. Было изучено влияние различных кормов, введённых в рацион, на молочную продуктивность, и установлено, что в опытной группе повысились жирность молока и содержание белка.По итогам исследования доказано, что корма, используемые в крестьянском хозяйстве «Кашым», являются качественными и полноценными. Также установлено, что оптимизация рациона способствует повышению продуктивности животных.

Ключевые слова: *крупный рогатый скот, казахская белоголовая порода, качество кормов, рацион, протеин, молочная продуктивность, кормление.*

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