

Article

The Effect of Feed on Herd Replacement Indicators in Cows

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Abstract: The inclusion of additional feed in the diet of dairy cows has a positive effect on herd replacement indicators. It ensures optimal duration of the service period and calving interval, enables obtaining one calf per cow annually, and increases the herd replacement coefficient by approximately 1.0–2.0%.

Keywords: Ration, supplementary feed, feeding, fertilization, herd replenishment.

Introduction

Cattle breeding is one of the leading sectors in Uzbekistan, and almost all of the milk and dairy products produced in the country are obtained from this sector. In order to further improve the stable supply of affordable and high-quality milk and dairy products to the population, a number of systemic measures have been implemented in recent years.

In particular, the Decree of the President of the Republic of Uzbekistan dated January 28, 2022, No. 60, "On the Development Strategy of the New Uzbekistan for 2022–2026," states that it is necessary to intensively develop agriculture on a scientific basis in order to at least double the incomes of farmers and dehqan households, increase the annual growth rate of agriculture to at least 5 percent, expand the feed base in livestock farming, and increase production volumes by 1.5–2 times. The document also emphasizes the importance of increasing the number and productivity of livestock, implementing new projects in the livestock sector, improving existing breeds, enhancing the genetic and productive characteristics of breeding animals, and creating highly productive dairy herds adapted to modern machine milking technologies. The implementation of these tasks and increasing the productivity of pedigree cattle are therefore considered important and highly relevant from a practical perspective [1].

In Uzbekistan, the effectiveness of utilizing the genetic potential of the Holstein breed to improve the productive and economically valuable traits of the Black-and-White breed has been demonstrated in the results of numerous studies [2].

Holstein cattle are distinguished not only by their high milk productivity but also by favorable reproductive performance. At the "Yaroslavlka" breeding farm located in the Yaroslavl region of Russia, in

2018 an average of 83 calves were obtained per 100 cows. The average daily weight gain of calves up to 18 months of age reached 763 g, while the live weight at the first insemination was 370 kg. In addition, the average milk yield per lactation was 8,405 kg, with a milk fat content of 4.31% and a protein content of 3.18% [3].

High milk productivity can negatively affect ovogenesis, folliculogenesis, fertilization, embryogenesis, and the birth of healthy calves in cows. The heritability coefficient of these traits is less than 0.10, which means that improving them through targeted selection and breeding programs is relatively ineffective. The mismatch between feeding and housing conditions, together with the increasing physiological demands associated with high milk production, is considered one of the main causes of reduced reproductive performance in cows [4].

Materials and Methods

The scientific research was conducted at the Mirshodilik Zaynilobiddin farm located in the Altinsay district of Surkhandarya region. This farm was established in 2014, and the total land area used for agricultural activities amounts to 80 hectares. During 2015–2017, Black-and-White and Red-and-White Holstein cattle were introduced to the farm and have since been bred in pure form[5].

For the purpose of the study, 30 first-calving cows raised on the farm were selected and divided into three groups. When selecting the animals, particular attention was given to their age, live weight, origin, and health status. The first group (control group) consisted of 10 cows, which were fed a balanced basic ration formulated from the feeds available on the farm according to standard nutritional requirements.

The remaining 20 cows were divided into two experimental groups (Group II and Group III), each consisting of 10 animals. During the early lactation period, their rations were supplemented with an additional 3–4 feed units of advance feed.

Currently, on the farm, Black-and-White and Red-and-White Holstein breeds, which are distinguished from other breeds by their high productivity and adaptability to various climatic conditions, are being bred. These breeds are widely raised in almost all regions of the Republic due to their valuable production characteristics.

Studying the adaptation of imported Holstein cattle to local climatic conditions, their breeding qualities, as well as their milk productivity, and increasing their genetic productivity potential determine the relevance and importance of this research topic [2].

According to the obtained data, a very large population of Holstein cattle has currently been formed in Germany, where their number exceeds 1.8 million head, accounting for about 53% of the total dairy cattle population in the country. In Germany, there are farms where cows produce 13–15 thousand kg of milk during a 305-day lactation period, and the lifetime milk productivity of cows can reach up to 175 tons[6].

The sexual maturity of cattle on the farm depends on several factors, including breed characteristics, feeding level, management practices, and climatic conditions. Dairy breeds of cattle generally reach sexual maturity earlier than beef breeds.

Insufficient feeding with nutritionally balanced and high-quality feeds negatively affects the reproductive activity of cows and may delay the onset of estrus. Disruptions in herd replacement indicators can cause significant economic losses for the farm[7].

Results and Discussion

Milk productivity in cows is influenced not only by their genotype but also significantly by paratypic factors, such as feeding and housing conditions. During the first weeks of lactation, newly calved cows often experience a decrease in feed intake. At the same time, due to a physiological condition known as lactation dominance, a large amount of milk is produced, and the animal's body mobilizes all its resources toward milk synthesis[8].

As a result, a negative balance of nutrients may occur between the nutrients entering the body and those excreted through milk. This imbalance leads to a deficiency of nutrients and energy, which the cow compensates for by utilizing reserve substances stored in the body. Consequently, the animal may lose weight and experience a reduction in live body mass[9].

Such conditions negatively affect the health status of the cow and may lead to a decrease in subsequent milk productivity. Therefore, during the lactation period it is extremely important to enrich the diet of high-producing dairy cows with feeds that are easily digestible and rich in energy, minerals, and vitamins, in order to maintain high levels of milk productivity[10].

In specialized cattle-breeding farms, artificial insemination is widely practiced. However, in some farms manual and natural mating methods are also still used. It is well known that, in addition to genetic and technological factors, the feeding factor—namely the adequacy of the ration and its balance in nutrients, minerals, and vitamins—plays a significant role in determining herd replacement indicators in cows[11].

In the farm where the study was conducted, the herd replacement indicators of the experimental cows were evaluated by analyzing the calving interval, service period duration, overall conception rate, and the conception index during the first insemination. These indicators were calculated using commonly accepted zootechnical methods. In particular, the service period was determined as the time from calving to successful fertilization, while the insemination index was calculated based on the number of semen doses used until successful conception was achieved[12].

Daily Feeding Ration of First-Calving Dairy Cows

No	Feed Type	Food quantity	Food unit	Exchange energy	Dry matter	Digestible protein	Raw nickname	Sugar	Cooking salt	Ca	P	Carotene
		<i>kg</i>	<i>kg</i>	<i>MDj</i>	<i>g</i>	<i>g</i>	<i>g</i>	<i>g</i>	<i>g</i>	<i>g</i>	<i>g</i>	<i>mg</i>
1	Alfalfa Hay	2	0,88	13,44	1660	202	506	40		34	4,4	98
2	Miscellaneous Grass Hay	3	1,32	19,35	2550	168	771	30		24,9	6	45
3	Winter Wheat Straw	2	0,4	9,52	1692	10	728	6		5,6	1,6	8
4	Corn Silage	19	3,8	43,7	4750	266	1425	114		26,6	7,6	380
5	Alfalfa Hay	5	1,75	20,95	2250	355	635	95		55	5	200
6	Sugar Beet	8	1,92	22,72	1840	56	112	960		4	4	2,4
7	Corn (Yellow) Grain	0,5	0,665	6,4	425	36,5	19	20		0,25	2,6	0,4
8	Wheat Grain	1	1,27	10,7	850	142	28	15		0,7	4,3	10,2
9	Barley Grain	1	1,15	10,5	850	85	49	42		2	3,9	0,4
10	Dish Salt	0,095							95			
	Total		13,155	157,28	16867	1321	4273	1322	95	153,1	61,4	744,4

The favorable herd replacement indicators observed in both the control and experimental groups indicate that the **Holstein cows** were well adapted to the technological conditions of the farm as well as to the local natural and climatic environment[13].

In order to determine the genetic potential of milk productivity in the experimental Holstein cows, additional advance feed was included in the general ration of the II and III experimental groups[14].

Cows in the first (control) group were fed a total ration containing 13.155 feed units, in which rough feed constituted 19.76%, succulent feed 56.78%, and concentrated feed 23.45%. In the second and third experimental groups, the proportion of feed components differed slightly: rough feed accounted for 14.27% and 18.63%, succulent feed for 52.97% and 54.31%, and concentrated feed for 32.76% and 27.06%, respectively. As a result of the additional feeding, the total ration reached 15.14 feed units in Group II and 16.315 feed units in Group III.

To determine the **genetic potential of milk productivity in cows**, additional feed nutrients were included in the general ration of the **II and III experimental groups**. The **amount of advance (additional) feed provided** is presented in the following table[15].

Table 2.

Amount of Advance Feed Given to the Experimental Cows

Feed type	Groups					
	I		II		III	
	O,b	%	O,b	%	O,b	%
Roughage	2,6	19,76435	2,16	14,26684	3,04	18,63316
Juicy feeds	7,47	56,78449	8,02	52,97226	8,86	54,30585
Concentrate feeds	3,085	23,45116	4,96	32,7609	4,415	27,06099
Total	13,155	100	15,14	100	16,315	100

The amount of roughage in Group I was higher than in Groups II and III by 0.44 kg. The quantity of succulent feed was also greater, exceeding that of the other groups by 0.55 kg and 1.39 kg, respectively. Similarly, concentrate feeds were provided in higher amounts, exceeding those in the other groups by 1.877 kg and 1.33 kg.

During the first 90 days of lactation, the average daily milk yield of the cows in the experiment was as follows: cows in Group I (control group) produced an average of 16 kg of milk per day, cows in Experimental Group II produced 20 kg, and the Red-and-White cows in Experimental Group III produced an average of 22 kg of milk per day.

During the early lactation period (the first 90 days of milk production), cows in Group II increased their average daily milk yield to 20–21 kg, while cows in Group III increased their daily milk production to 22–25 kg.

The service period is one of the main indicators determining the reproductive performance of cows, and this indicator remained within the optimal range in the experimental animals. In practice, although cows may exhibit estrus 20–40 days after calving, insemination was carried out not earlier than 60 days after calving, usually during the second or third estrus cycle. In the experimental groups, the service period lasted between 68 and 80 days, which ensured that the calving interval did not exceed one year.

The insemination index was better in the experimental groups receiving advance feed compared with the control group. The best insemination index was recorded in Experimental Group III, where the smallest number of semen doses (1.5 doses per cow) was required for successful fertilization. This value was 0.2 doses (11.7%) lower than in the control group and 0.1 doses (6.2%) lower than in Groups I and II.

Conclusion

In conclusion, the inclusion of additional feed in the diet of dairy cows has a positive effect on herd replacement indicators. It ensures optimal durations of the service period and calving interval, allows farmers to obtain one calf per cow annually, and increases the herd replacement coefficient by approximately 1.0%.

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