Original Article

Development of feeding and reproduction technology in dairy cattle breeding based on the use of digital technologies

Desenvolvimento da tecnologia de alimentação e reprodução na pecuária leiteira com base na aplicação de tecnologias digitais

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Abstract

A study on the study of the qualitative assessment of the behavior of dairy cattle according to the VAS system (visual analog scale) was conducted in the LLP "Agrofirme "AKAS", located in the West Kazakhstan region of the Republic of Kazakhstan. According to research, it follows that different seasons of time affect the conditions of detention in different ways. So, for the maintenance of cows in the summer, the distance of avoidance at the feeding site according to test 1 and 2 is within 3 meters, whereas in spring and autumn it was 2 meters. The difference between the reference norm and the household ration has been determined, from which it follows that the feeding ration of the farm corresponds to the norm of 12 kg of milk yield per head per day. The vitamin and mineral premix developed by us includes vitamins, minerals, including macro-microelements. The premix also includes components in the following ratio: phosphorus (P) – 5% of monocalcium phosphate, vitamin A – 1.2% of rovimix A 1000, vitamin D3 – 0.64% of rovimix D3, vitamin E – 16% of rovimix E-50, manganese (Mn) – 22.2%, copper (Cu) – 9%, zinc (Zn) – 19%, iodine (I) – 0.28%, selenium (Se) – 7.65 and cobalt (Co) – 0.14%, and feed chalk – 5% and chickpea flour – 13.89% are used as fillers as a source of calcium (Ca).. The average daily milk yield at the beginning of the experiment in both study groups was in the range of 10.6-10.8 kg. At the end of the experiment, the average daily milk yield in animals receiving premix exceeded their peers from the control group by 1.4 kg or 1.6%. According to the chemical composition of milk, the indicators of fat, protein and lactose were higher in the cows of the experimental group compared with the peers of the control group (for fat – 3.92>3.37, for protein – 3.32>3.23, for lactose - 4.16>4.01).

Keywords: holstein black and white breed, simmental breed, milk productivity, feeding, intensification, reproduction, sexed seed.

Resumo

O estudo sobre a avaliação qualitativa do comportamento do gado leiteiro pelo sistema EVA (escala visual analógica) foi realizado na empresa Agrofirme AKAS LLP, localizada na região Oeste do Cazaquistão, da República do Cazaquistão. De acordo com estudos, diferentes estações do tempo afetam as condições de detenção de maneira diferente. Assim, para a manutenção de vacas no verão, a distância de evitação no local de alimentação, de acordo com os testes 1 e 2, está dentro de 3 metros, enquanto na primavera e no outono era de 2 metros. A diferença entre a norma de referência e a dieta econômica foi determinada, o que significa que a dieta alimentar da fazenda corresponde a uma taxa de 12 kg de produção de leite por cabeça por dia. A pré-mistura de vitaminas e minerais desenvolvida inclui macroelementos. Além disso, a composição da pré-mistura contém componentes na seguinte proporção: fósforo (P), 5% de fosfato monocálcico; vitamina A, 1,2% de Rovimix A1000; vitamina D3, 0,64% de Rovimix D3; vitamina E, 16% de Rovimix E50; manganês (Mn), 22,2%; cobre (Cu), 9%; zinco (Zn), 19%; iodo (I), 0,28%; selênio (Se), 7,65; cobalto (Co), 0,14%, além de 5% de giz forrageiro e 13,89% de farinha de grão-de-bico, usados como fonte de cálcio para enchimentos. A produção diária média para o início da experiência em ambos os grupos estudados foi de 10,6 a 10,8 kg. No final do experimento, a produção diária média dos animais que receberam a pré-mistura excedeu seus pares do grupo controle em 1,4 kg, ou 1,6%. Em termos de composição química do leite, os indicadores de gordura, proteína e lactose foram maiores nas vacas do grupo experimental em comparação com os pares do grupo controle (para gordura, 3,92 > 3,37; para proteína, 3,32 > 3,23; para lactose, 4,16 > 4,01, respectivamente).

Palavras-chave: raça holandesa preto e branco, raça simental, produtividade leiteira, alimentação, intensificação, reprodução, semente sexuada.

1. Introduction

The development of dairy cattle breeding is of great importance in ensuring the food independence of Kazakhstan, since milk is a daily food product of the country's population. To date, there is a need in dairy cattle breeding to rethink the old and identify new, original approaches to research in this industry with the creation and use of fundamentally new techniques (Dunin et al., 2021). The efficiency of dairy cattle breeding is determined by the level of productivity of cows, therefore, one of the main indicators of profitability of a dairy farming farm is the productivity of a dairy herd (Tuzov et al., 2018; Foksha and Konstandoglo, 2019). The main factors of increasing milk productivity are the breed of cattle, feeding, maintenance, breeding work (Surkova et al., 2021).

In this regard, it should be noted that the intensification and improvement of the efficiency of dairy cattle breeding is impossible without increasing the productivity of cows. In turn, it is impossible to increase productivity without special developments according to the standards of maintenance, feeding, reproduction, optimal schemes for the directed cultivation of heifers and the production of resource-saving highly digestible compound feeds of a new generation with programmable properties.

One of the problems of modern dairy cattle breeding is the lack of a competent approach to the control and planning of the technological process of keeping and exploiting animals. Violation of these requirements is one of the main reasons that do not allow achieving high economic indicators of production in the livestock sector. In the developed countries of the world, the development of intensive and efficient agricultural production is ensured today both through the introduction of new production processes and by improving the information technology base for managing these processes. As a rule, modern information technologies are the main factor of agricultural production efficiency. Such economic indicators as profit, the level of profitability of production, make it possible to assess the effectiveness of a single agricultural sector in a market economy. The ultimate goal of introducing new information technologies is to maximize these indicators (Skorkin et al., 2012; Kharzhau et al., 2019; Tultabayeva et al, 2023).

The choice of a particular technology is determined by the specific conditions of the economy, the size and layout of premises for reconstruction and new construction, as well as financial resources for the acquisition of highly efficient means of mechanization and automation of production. One of the most progressive is the technology of feeding cattle with complete feed mixtures. In such a mixture, easily digestible carbohydrates, protein, fiber, micro- and macroelements are in the right ratio for proper digestion. These conditions are met if the full-fledged feeding of cows is carried out according to improved scientifically-based detailed standards that take into account the need of animals for energy, carbohydrates, fat, minerals and vitamins; it is mandatory to include coarse, juicy and concentrated feeds in the optimal ratio in the diets. In comparison with separate feeding of feed, dairy productivity of cows increases by 7-15%, reproduction and animal health indicators improve, and feed consumption decreases by up to 15%. On dairy farms, the preparation, delivery and distribution of feed mixtures to feed tables is carried out by mobile distributors-mixers of various types and their analogues adapted to the conditions of domestic livestock farms (Lachuga, 2020; Tokysheva et al., 2023; Morozov and Morozova, 2012).

An important role at the present stage of development of dairy cattle breeding is acquired by the use of energy- and resource-saving technologies that reduce production costs and increase the profitability of the industry (Popov and Pavlov, 2008).

The optimal level of reproduction of cows is ensured by the normal functioning of the whole organism and, first of all, the organs of the reproductive system. According to the research of scientists (Minina and Ioshchik, 2007), the reproductive function of cows is also most influenced by the conditions of maintenance and the level of feeding.

The conditions of maintenance and the level of feeding, a decrease in the body's resistance against the background of metabolic disorders, infectious diseases that have an indirect effect through the immune status of highly productive cows or even a direct effect on fertilization, pregnancy and the postpartum period. For example, such as Leptospirosis, Brucella or Neospora causing abortions and, consequently, reducing milk production in herds and sometimes fertility are the main predisposing causes for low reproductive function in cows (Fray et al., 2002).

More objective factors include errors and shortcomings in the conditions of detention, such as low nutritional value of the diet, hypocalcemia, mastitis and injuries, which lead to a decrease in reproductive ability. In emaciated cows with low body weight and high milk yield in the early postpartum period, the service period is delayed by more than 10 days, as well as with mastitis, retention of the afterbirth, hypocalcemia and endometritis, the service period increases by 7, 8, 26 and 31 days, respectively, compared with conditionally healthy cows without pathologies reproductive system. In cows with characteristic signs of breast pathology, luteal activity begins 7 days later than in healthy cows (Lopez-Gratius et al., 2003; Sheldon et al., 2019; Fricke and Wiltbank, 2022; Pereira et al., 2022; Raboisson et al., 2014; Huszenicza et al., 2005).

The occurrence of disorders or the absence of uterine contractions is mainly facilitated by a deficiency in the diet of vitamins and minerals, the lack of regular exercise, inflammatory processes in the genitals of cows. In the absence or weakness of these contractions, there is an accumulation of lochiae in the uterine cavity, and postpartum uterine diseases develop (uterine subinvolution, sapremia, endometritis). These diseases of the uterus are always associated with a weakening of the resistance of the body, a violation of the tone of the uterus, the absence of uterine contractions, a delay in the allocation of lochiae and their accumulation in the uterine cavity. If microorganisms penetrate into the uterine cavity during subinvolution, then under their influence lochia begin to gradually decompose and develop postpartum endometritis (Leutert et al., 2012; Darmenova et al., 2018).

The use of a device for determining uterine contractions (POMS) allows for early diagnosis of uterine contractions

in the subsequent stage and in the postpartum period, and, consequently, related uterine diseases in cows, for the timely application of therapeutic and preventive measures (Darmenova et al., 2022).

At present, the development and implementation of innovative technologies is a promising industry in all areas of production, including in the reproduction of dairy cattle. In the reproduction of cattle, special attention is paid to the method of insemination with a seed divided by sex (De Vries et al., 2008).

It is known that in dairy cattle breeding, sperm containing the X chromosome, which determines the female sex, is in great demand, in meat - the Y chromosome, which determines the male sex. The efficiency obtained from the use of this technique is 65-95% of individuals of the desired sex (Kharitonova, 2010; Schenk and Everett, 2007).

Thus, the results of research on the development of technological parameters for the maintenance, reproduction and feeding of dairy cattle will be the basis for research work on the development of technologies for the maintenance, feeding, cultivation and reproduction in dairy cattle breeding based on the use of adapted resource-saving and digital technologies for various climatic zones, which determines the relevance of the project.

Based on the above, the purpose of the research was to determine the optimal conditions for feeding, keeping and reproduction of dairy cattle in the Western region of Kazakhstan.

This goal is achieved by solving the following tasks:
- collection and processing of material for the development of scientifically sound, organizational and technological standards for the maintenance, feeding and reproduction of dairy cows in farms located in various regions of the republic, allowing to increase milk production;
- development of technological schemes for growing heifers for the purpose of early fruitful fertilization of young animals at 15 months of age;
- development of ways to increase the conversion of nutrients and the productive effect of feed in dairy cattle breeding.

2. Material and Methods

The scientific work was carried out in the LLP "Agrofirma "AKAS" of the West Kazakhstan region, KH "Anisan" and KH "Esbol" of the Aktobe region.

The objects of the study were brood herds of Holstein black-and-white and Simmental breeds.

Studies on maintenance standards were conducted on the basis of the protocol for assessing the welfare of cattle of the Welfare Quality® project within the framework of the 6th Framework Study of the European Commission, contract No. FOOD-CT-2004-506508 (Welfare Quality, 2018).

Studies on the feeding standards of dairy cows were conducted in accordance with the recommendation of Alexander Hristov, Doctor of Sciences, Professor at the University of Pennsylvania. According to the recommendation, the feeding rations of farms, reproductive indicators and productive indicators of cows in the context

of technological groups of farms for at least 6 months were analyzed this year:
- sampling of feed and their chemical analysis – according to GOST 27262-87 and according to classical methods of zootechnical analysis (Hostiou et al., 2017; Rotz et al., 2019), preparation of samples for analysis GOST ISO 6498-2014; determination of dry matter GOST 31640-2012;
- milk sampling according to the requirements of ST RK ISO 707-2011: milk productivity – according to breeding records and control milking; milk composition, determination of fat, protein, lactose on the milk analyzer Expert standard, counting the number of somatic cells on the analyzer Ecomilk Scan;
- selection of 20 heads of black-and-white dairy cows, divided into experimental (n=10) and control (n=10) groups in order to conduct zootechnical experience in adjusting diets.
- assessment of the condition of BSC dairy cattle was carried out using the following methods: UC Davis Veterinary Medicine Extension, USA, 2010; D. Vereshchagin "Score assessment of fatness of cows", 2005; information materials of CRV company (Holland).

Studies on reproduction standards were conducted according to generally accepted methods and developed standards, according to the recommendations of scientists at the University of Pennsylvania, including: 1) rectal palpation, the use of an ultrasound scanner (KAIXIN KX5200), visually through Alpha vision; 2) the use of modern biotechnological methods to increase the breeding stock – by purchasing same-sex semen of at least 150 doses and inseminating cows and heifers with it.

Research on the development of ways to increase the conversion of nutrients and the productive effect of feed in dairy cattle breeding:
- the study of the chemical composition of feed was determined on the basis of infrared spectrum radiation on NIRS2500 (FOSS) equipment (S.Seifullin KazATU laboratory) and classical methods of zootechnical analysis;
- to study the effect of the vitamin-mineral premix developed by us on milk productivity (milk yield and milk quality indicators) by including 150 g per head in the diet of the experimental group, mixed with concentrated feed.

3. Results and Discussion

Scientific work on the study of the qualitative assessment of the behavior of dairy cattle according to the VAS system (visual analog scale) was carried out in the LLP "Agrofirme "AKAS", located in the West Kazakhstan region of the Republic of Kazakhstan.

In the LLP "Agrofirme "AKAS", the cattle of the Holstein black-and-white breed are kept loose in two cowsheds: summer and winter. There is a milking parlor equipped with a Herringbone milking machine without software. Near each base there are walking grounds, designed for 15 m² per head. There is no irrigated agriculture on the farm, so the harvesting of feed resources proceeds

unevenly every year, completely depending on the weather conditions of the region.

According to the visual analog scale (VAS) of qualitative assessment of the behavior of dairy cattle in the spring season, the results were obtained:

According to research, it follows that different seasons of time affect the conditions of detention in different ways. So, for the maintenance of cows in the summer, the distance of avoidance at the feeding site according to test 1 and 2 is within 3 meters, whereas in spring and autumn it was 2 meters.

The visual analog scale of qualitative behavior assessment (VAS) met the following criteria by season: in spring and autumn, the activity of cows decreases to 35%, and in summer it increases to 44%, the number of "frightened" heads in spring is 22%, while in summer and autumn their number decreases to 10%, as well as the number of irritable and "restless" cows in spring and autumn reaches up to 20%, and in summer the percentage drops to 11%. The proportion of "atypical" cows in all seasons of time did not exceed 5%, while the number of "upset" cows in spring showed 33%, and in summer and autumn 24%.

The results of observation of social behavior and cough: in the "standing" position in spring and autumn from 17 to 26 heads, whereas in summer the number of "standing" cows is up to 10 heads. Taking food and drinking in the spring 31 heads, and in the summer and autumn amounted to 46 heads. The "lying" of animals in the spring and autumn time according to the test was up to 5 heads, and in the summer up to 7 heads.

During the observation, the "agonistic" behavior of animals was observed, which was reflected in the following indicators: the "headbutt" of animals in all seasons amounted to up to 5 heads of cows, as well as "chase, pursuit" in herds varies up to 7 heads. The movement of animals in herds in spring is increased to 21 heads, and in summer and autumn it is reduced to 11 heads. The "fight" of animals in the herds in the spring is observed up to 12 heads and decreases to 3 heads of cows in the remaining seasons of the year. There was no cough in the herd during the studies.

The condition of the limbs, sides, udders of cattle clean according to the point system "0" in spring and summer time significantly increases to 53 heads, and in autumn time decreases to 31 heads, also dirty "2" in spring and summer time to 14 heads, and in autumn time to 30 heads.

According to the skin, the absence of wool in all seasons varies from 4 to 8 heads, injuries are flattened, wrists from 4 to 7 heads, lameness from 3 to 5 heads.

Neck/shoulder blade/back injuries – up to 5 cows in herds. During the observation, 9 cows suffered from dystocia in the last 12 months, the diagnosis of cow paresis in the last 12 months was observed in 11 heads. Nasal and ocular discharge, shortness of breath 3 goals. Animals are not subjected to pruning of horn appendages /decontamination on the farm and trimming of tails.

It follows from the above that when using a loose method of keeping cows, it is desirable to use the technological techniques proposed by the plan for a visual analog scale of qualitative assessment of behavior (VAS), which allow avoiding negative technological pressure on the animal body, causing a violation of normal physiological processes and a general weakening of the body, which ultimately leads to their premature retirement from herds.

Taking into account the data of animal monitoring by the VAS system in the basic farm, it is recommended to focus on natural and climatic, organizational and economic, technological and feeding conditions.

Scientific research on the study of feeding technology was carried out in the farm "Anisan" and farm "Esbol" of Aktobe region with the definition of zootechnical analysis of feed used in farms.

The basic farms under study are engaged in their own feed production, i.e. the cultivation of feed and, accordingly, their harvesting is carried out at the enterprise itself. The purchase is made only of high-protein concentrated feeds.

KH "Anisan" has a pasture of 7000 hectares, haymaking – 3000 hectares, irrigated land – 500 hectares and arable land – 4000 hectares. The farm is mainly engaged in harvesting hay and concentrated feed, of which crushed barley.

In the farm "Anisan", animals are in the pasture in the summer, after evening milking, animals in the paddock are fed with crushed barley in the amount of 4 kg per head per day.

During the stall period, the feeding ration consists of hay of various grasses and crushed barley. The chemical composition of feed in the Anisan farm is presented in Table 1.

From the data of the zootechnical analysis of the feed base of the Anisan farm presented in Table 1, an analysis of the feed quality was carried out, from which it follows:
- in hay grass: protein – 8.3%; fat – 2.7%; fiber – 31.99%; ash – 11.1%; sugar – 3.12%; starch – 0.24%; carotene – 16.6 mg; Ca – 0.88%; P – 0.27%;
- in crushed barley: humidity – 9.1; protein – 4.1%; fat – 2.6%; fiber – 6.09%; ash – 3.01%; starch – 46.81%.

The Esbol farm has a livestock complex and 3,200 hectares of land, part of which is used for haymaking, sown with corn and grain crops, and also used for pastures in the summer to provide the livestock complex with fodder.

The Esbol farm uses a system of irrigation feed production. Therefore, climatic conditions have not affected the stability of obtaining green mass in this farm this year.

Table 1. Chemical composition of KH "Anisan" feed.

Type of feed	Protein, %	Fat, %	Raw fiber, %	Ash, %	Sugar, %	Starch, %	Carotene, mg	Ca, %	P, %
Hay forbs	8.3	2.7	31.99	11.1	3.12	0.24	16.6	0.88	0.27
Crushed barley	4.1	2.6	6.09	3.01	–	46.81	–	–	–

Cow feeding rations include corn silage and alfalfa hay, as well as bran.

In summer, during the daytime, the animals are in the pasture, in the evening they are driven into special pens, after milking, the animals are fed with concentrated feed in the amount of 4 kg per head per day.

During the stall period, the feeding ration consists of silage, alfalfa hay and various grasses, as well as bran.

The chemical composition of feed in the Esbol farm is presented in Table 2.

Thus, it follows from the material presented above that in the Anisan farm the animals are in the pasture in the summer, after evening milking the animals in the paddock are fed with crushed barley in the amount of 4 kg per head per day. During the stall period, the feeding ration consists of hay of various grasses and crushed barley. The analysis of feed quality was carried out, according to which the following herbs are contained in hay: protein – 8.3%; fat – 2.7%; fiber – 31.99%; ash – 11.1%; sugar – 3.12%; starch – 0.24%; carotene - 16.6 mg; Ca – 0.88%; P – 0.27%; in crushed barley: humidity – 9.1; protein – 4.1%; fat – 2.6%; fiber – 6.09%; ash – 3.01%; starch – 46.81%.

Cow feeding rations in the Esbol farm include corn silage, alfalfa hay, bran.

In the Esbol farm, animals are also in the pasture during the summer during the daytime, in the evening they are driven into special pens, after milking the animals are fed with concentrated feed in the amount of 4 kg per head per day. During the stall period, the feeding ration consists of silage, alfalfa hay and various grasses, bran.

The analysis of feed quality was carried out, according to which the following herbs are contained in hay: protein – 8.9%; fat – 2.8%; fiber – 31.01%; ash – 12.72%; starch – 0.21%; carotene - 17.4 mg; Ca – 0.38%; P – 0.30%; in alfalfa hay: protein – 13.0%; fat – 1.6%; fiber – 34.34%; ash – 8.48%;

starch – 2.65%; carotene – 23.15 mg; Ca – 0.62%; P – 0.20%; in silage: protein – 12.7%, fat - 2.4%, fiber - 38.55%, sugar – 3.45%, starch – 14.19%, ash – 26.82%, Ca – 0.86%, P – 0.36%; in bran: moisture – 15.8; protein – 12.8%; fat – 3.5%; fiber – 4.34%; ash - 2.45%; starch - 46.48%.

Table 3 below shows the feeding ration of the Esbol farm.

During the monitoring, the average productivity indicators of cows in the study period in the Anisan farm were as follows:

- according to the technological group "high–yielding cows": fatness, BSC – 2.83±1.01, average pregnancy day – 288.5±5.54 days, lactation age – 2.34±6.04, age of the first calving - 41.1±7.51 months, interbody interval – 313.0±11.6 days. The average live weight of a calf at birth is 34.0±4.21 kg. The average productivity of milk yield for the herd was 13.4 ± 3.01 kg, the quality indicators of milk were: fat – 4.02± 2.65%, protein – 3.16 ± 1.87%, lactose – 4.2± 1.07%, urea – 17.9± 2.76%, the number of somatic cells – 480.9± 8.01 thousand.

- according to the technological group "low–fat cows": fatness, BSC - 2.81±1.91, average pregnancy day – 287.3±6.74 days, lactation age – 2.72±6.34, age of the first calving – 41.3±7.90 months, interbody interval - 352.3±10.3 days. the average live weight of a calf at birth is 34.0±4.98 kg. The average productivity of milk yield for the herd was 7.03 ± 2.18 kg, the quality indicators of milk were: fat – 3.96± 3.01%, protein – 3.11± 1.54%, lactose – 4.2± 1.87%, urea – 16.1± 2.78%, the number of somatic cells – 482.1± 7.54 thousand.

- according to the technological group "dry cows": fatness, BSC – 3.33±1.66, average pregnancy day – 288.13± 6.01 days, lactation age – 3.11±5.78, age of the first calving – 41.7±7.02 months, interbody interval – 347.5± 10.5 days. The average live weight of a calf at birth is 34.0±4.34 kg.

Table 2. Chemical composition of Esbol farm feed.

Type of feed	Protein, %	Fat, %	Raw fiber, %	Ash, %	Sugar, %	Starch, %	Carotene, mg	Ca, %	P, %
Hay forbs	8.9	2.8	31.01	12.72	-	0.21	17.41	0.38	0.30
Alfalfa hay	13.0	1.6	34.34	8.48	-	2.65	23.15	0.62	0.20
Corn silage	12.7	2.4	38.55	8.22	3.45	14.19	26.82	0.86	0.36
Cut	12.8	3.5	4.34	-	-	46.48	-	-	-

According to the results of the zootechnical analysis of the feed base in the Esbol farm, an analysis of the feed quality was also carried out, which follows: hay grass: protein – 8.9%; fat – 2.8%; fiber – 31.01%; ash – 12.72%; starch - 0.21%; carotene - 17.4 mg; Ca – 0.38%; P – 0.30%; alfalfa hay: protein – 13.0%; fat – 1.6%; fiber – 34.34%; ash – 8.48%; starch - 2.65%; carotene - 23.15 mg; Ca – 0.62%; P – 0.20%; - silage: protein – 12.7%, fat – 2.4%, fiber – 38.55%, sugar – 3.45%, starch - 14.19%, ash – 26.82%, Ca – 0.86%, P – 0.36%; - bran: moisture – 15.8; protein – 12.8%; fat – 3.5%; fiber – 4.34%; ash – 2.45%; starch – 46.48%.

Table 3. Feeding ration in the Esbol farm.

Technology Group	Feeding ration, kg/day			
	Hay forbs	Alfalfa hay	Corn silage	Cut
Dry cows, kg	2	5	12	4
Highly productive cows, kg	5	5	15	4
Low productive cows, kg	5	5	15	4

Figures 1-3 clearly show the productive indicators, economically useful signs and chemical composition of milk in the Anisan farm.

According to the data presented in the table, the dry matter content in the diet of cows in the dry cows technological group was 15.4 kg, in highly productive and low-productive cows 14.5 kg, also similar indicators for OE were 136 and 119 MJ, digestible protein – !227 g and 1305 g, crude fiber 4164 g and 3310 g, NDK – 8002 g and 7073 g, ADK – 5159 g and 4054 g, respectively.

Analyzing the data in the studied period, it can be summarized that the level of feeding on the farm affects milk productivity, the average age of the first fruitful insemination of heifers older than 18 months has also
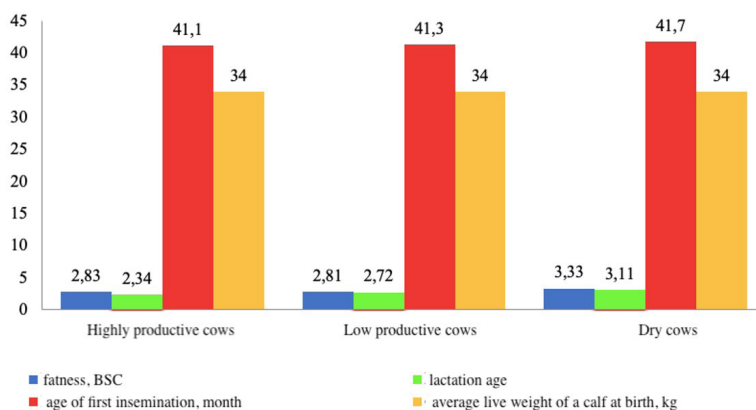

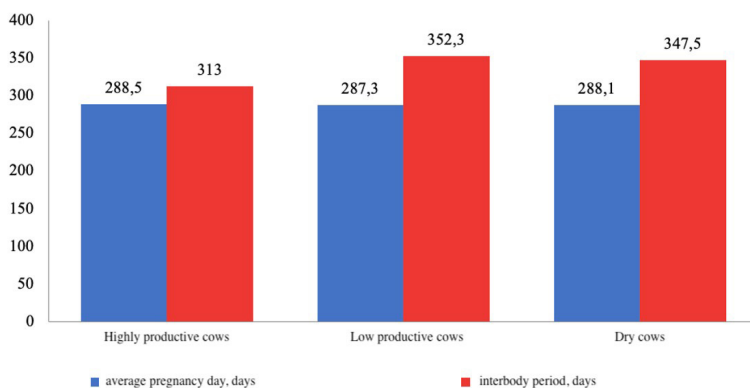**Figure 1.** Productive indicators of the KH "Anisan" herd.

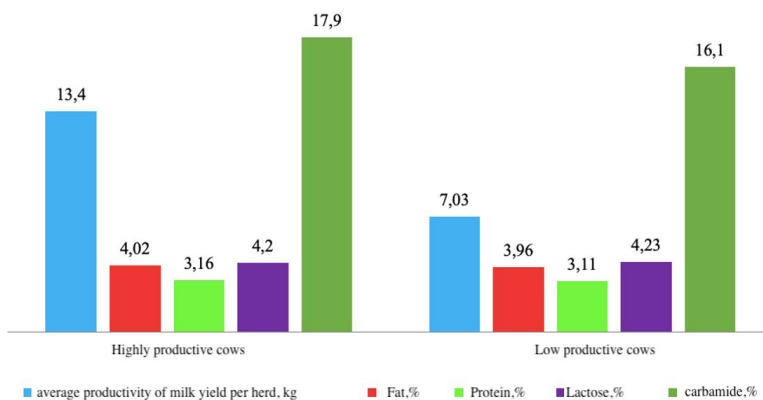**Figure 2.** Economically useful signs of the Anisan cattle herd.

Figure 3. Chemical composition of KH "Anisan" milk.

increased, which leads to a decrease in the milk yield level, so in our case the average age of the first insemination was 41.5 months. Also, milk productivity is affected by the presence of other factors acting comprehensively, for example, microclimate, veterinary and sanitary condition, feeding regime, type of feeding, etc.

Scientific research on the technology of herd reproduction was carried out in KH "Anisan", KH "Esbol" Aktobe region and LLP "Agrofirma "AKAS" West Kazakhstan region.

In the Esbol farm, breeding cattle of the Simmental breed are bred. The number of stalls on the farm is 6. Cash cows have access to pastures. The number of employees working full–time is 32. Over the last 12 months, 370 goals. cows in milking, 180 head. in a dry-hardy herd. The number of pregnant cows – 180 heads, repair heifers – 60 heads. Days before the first insemination – 45, days between conception and calving – 286. The indicators of the concept rate (all services) is 180/169, the concept rate to first service is 169/91. The service interval in the herd is on average 60 days. There are no aborted pregnant cows in the herd, the number of culled cows due to low fertility is 7 heads. Indicators of reproductive herd management: artificial insemination – yes, breeding of bulls – no, visual detection of hunting –yes, means of detecting hunting – no, synchronization of estrus, ovulation – yes, sexed sperm – yes, the percentage of cows inseminated by the primary inseminator – 54%. The synchronization scheme is used: Ovsinh, Surfagon 10 ml., Magestrophan 3.3ml., Surfagon 5 ml.

In the LLP "Agrofirme "AKAS", breeding cattle of the Holstein black-and-white breed are bred. The number of stalls on the farm is 6. Cash cows have access to pastures. The number of employees working full–time is 16, part–time is 10. Over the last 12 months. 75 goals. cows in the dairy, 90 head. in a dry-hardy herd. The number of pregnant cows – 72 heads, repair heifers – 60 heads, mature bulls – 9 heads. On average, 750 kg of milk is milked per day. Days before the first insemination – 58, days between conception and calving – 30. The indicators of the concept rate (all services) is 72/90, the concept rate to first service is 72/43. The service interval in the herd is on average 60 days. There are no aborted pregnant cows in the herd, the number of culled cows due to low fertility is 7 heads. Indicators of reproductive herd management: artificial insemination – yes, breeding of bulls – yes, visual detection of hunting –yes, means of detecting hunting – no, synchronization of estrus, ovulation – yes, sexed sperm – yes, the percentage of cows inseminated by the primary inseminator – 60%. The synchronization scheme is used: Ovsinh, Surfagon 10 ml., Magestrophan 3.3ml., Surfagon 5 ml.

In the Anisan farm, breeding cattle of the Holstein black-and-white breed are bred. The number of stalls on the farm is 6. Cash cows have access to pastures. The number of employees working full–time is 5. Over the last 12 months, 80 goals. cows in the dairy, 93 head. in a dry-hardy herd. The number of pregnant cows – 68 heads, repair heifers – 50 heads, mature bulls – 5 heads. On average, 850 kg of milk is milked per day. Days before the first insemination – 55, days between conception and calving – 288. The indicators

of the concept rate (all services) is 72/93, the concept rate to first service is 72/35. The service interval in the herd is on average 60 days. There are no aborted pregnant cows in the herd, the number of culled cows due to low fertility is 7 heads. Indicators of reproductive herd management: artificial insemination – yes, breeding of bulls – yes, visual detection of hunting –yes, means of detecting hunting – no, synchronization of estrus, ovulation – yes, sexed sperm – yes, the percentage of cows inseminated by the primary inseminator – 49%. The synchronization scheme is used: Ovsinh, Surfagon 10 ml., Magestrophan 3.3ml., Surfagon 5 ml. During the gynecological examination, the following were determined:

- in the Anisan farm (n=153), the main and predisposing etiological factors of infertility of cows, while with pathology of the genitals 44 heads – 29%, pregnant 42 heads - 27% and without pathologies 67 heads - 44% of cows;
- in the Esbol farm (n=193), the main and predisposing etiological factors of infertility of cows, while with pathology of the genitals 76 – 39%, pregnant 34 – 18% and without pathologies 83 – 43%.
- in AF AKAS LLP (n=154), the main and predisposing etiological factors of infertility of cows, while with pathology of the genitals 34 heads – 22%, pregnant 67 heads - 44% and without pathologies 53 heads - 34% of cows.

Based on comprehensive diagnostic studies of gynecological diseases in the cows studied, it was established (Table 4):

- in Agrofirma Akas LLP: endometritis – 3 goals, persistent yellow body – 3 goals, uterine subinvolution – 9 goals, ovarian hypofunction – 6 goals, vulvitis – 9 goals, ovarian cyst – 4 goals.;
- in the Esbol farm: uterine subinvolution – 20 goals, vulvitis and vestibulovaginitis – 16 goals, endometritis – 15 goals, ovarian hypofunction – 13 goals, follicular cyst – 4 goals, persistent yellow body - 8 goals.
- in the Anisan farm: endometritis – 7 goals, persistent yellow body – 6 goals, uterine subinvolution – 13 goals, vulvitis – 8 goals, cyst – 10 goals.

The treatment of gynecological diseases was carried out according to the treatment regimens presented in Tables 5-8.

Treatment of persistent yellow body was carried out according to the following scheme: 1 day – In / m Magestrophan 3 ml; 2 day – In / m Magestrophan 3 ml + in / m Vitamin E 5 ml.

Summing up, we can say that the selected treatment regimens have good results within the framework of its use in basic farms. Thus, 40% of "Esbol" farm underwent treatment, "Anisan" farm – 29%, "AF "AKAS" LLP – 34% of the total livestock. All the livestock that were treated were successfully cured.

150 heads of cows and heifers were inseminated with the same–sex seed, of which 20 heads were in the Esbol farm, 52 goals were in the AKAS AF LLP, 78 goals were in the Anisan Farm. The same-sex seed of the Simmental breed of the WAYNE DE 09 463 75031 bull was used in the Esbol farm. The same-sex seed of the Holstein black-and-white breed of the bull-producer AltaRECOIL 011HO11736 was

Table 4. Analysis of the gynecological condition of dairy cows.

Indicator	Esbol Farm			Anisan Farm			Agrofirma AKAS LLP		
	Revealed, heads	Cured, heads/%		Revealed, heads	Cured, heads/%		Revealed, heads	Cured, heads/%	
Endometritis	15	15	100	7	7	100	3	3	100
Cyst	4	4	100	10	10	100	4	4	100
Vulvitis	16	15	100	8	8	100	9	9	100
Persistent yellow body	8	8	100	6	6	100	3	3	100
Subinvolution of the uterus	20	20	100	13	13	100	9	9	100
Ovarian hypofunction	13	13	100	-	-	-	6	6	100
The condition of the reproductive organs is normal, including steel	117	-	-	109	-	-	65	-	-
total	193			153			99		

Table 5. Treatment of endometritis.

Name of drugs	Place of administration and dose	Days					
		1	2	3	4	5	6
Ainil 10%	3 ml /100 kg m.t.w. intramuscularly	*	*	-	-	-	-
Ceftimag	1 ml / 100 kg m.t.w. intramuscularly	*	*	*	*	*	-
Endometromag - Bio	Intrauterine	150 ml	50 ml	50 ml	20 ml	20 ml	
Vitamin E	1 ml. per head	-	-	-	-	-	*

Note * – treatment days

Table 6. Treatment regimens for cows with ovarian hypofunction.

Procedures, drugs, dose, place of administration	Treatment days			
	1	3	7-14 days	11
Multivit 15 ml intramuscularly	+			
Ovarian massage	+	+		
Sedimine 15-20 ml intramuscularly	+			
When hunting occurs 8-10 hours before insemination, intramuscularly Surfagon 2-5 ml.			+	
If sexual hunting is not manifested intramuscularly, Surfagon in a dose of 10 ml, Folligon 500-1000 IU.			+	
When hunting occurs 8-10 hours before insemination, intramuscularly Surfagon 2-5 ml. Multivit 15 ml/m, Sedimine 15 ml/m				+

Table 7. Treatment regimens for cows with follicular ovarian cyst.

Procedures, drugs, dose, place of administration	Treatment days				
	1	2	3	4	11
Surfagon 25 mcg (5 ml) intramuscularly	+	+	+		
Estrophan 2 ml intramuscularly					+

used in AF AKAS LLP and Anisan Farm. The results of artificial insemination of cows and first heifers with sexed seed are presented in Table 9.

An analysis of the data in Table 10 shows that 20 heads were inseminated with a same-sex seed in the Esbol farm. cows, of which 2 heads, or 10%, came to re–hunt, pregnant

- 15 heads, or 75%, yalovye – 3 heads, or 15%. In the Anisan farm, 78 heads of cows (63 heads) and heifers (15 heads) were inseminated with same-sex seed, of them by cows: 12 heads, or 19%, came to re-hunt, pregnant – 48 heads. or 78%, yalovy – 15 goals. or 24%; for heifers: 2 goals came to the second hunt, or 13%, pregnant – 12 goals, or 80%,

Table 8. Treatment regimen for cow uterus subinvolution.

Drugs and dose, place of administration	Prevention days									
	1	2	3	4	5	6	7	8	9	10
Their Glucovit 30 ml / m	+		+		+		+		+	
Uterine lavage with furacilin solution 1:5000		+		+						
Metricur 20 ml in/ uterine			+		+					
Massage of the uterus through the rectum	+	+	+	+	+					
Multivit I/m 5 ml	+									+
ASD F 2 p/c 5%-20 ml		+		+		+		+		+

Table 9. Results of artificial insemination and heifers with sexed seed.

Indicators	Against the background of hormonal stimulation			
	cows		heifers	
	n	%	n	%
Esbol Farm				
Selected and carried out inseminations	20	100	-	-
Repeated hunt	2	10	-	-
Bedding	15	75	-	-
barren	3	15	-	-
Anisan Farm				
Selected and carried out inseminations	63	100	15	100
Repeated hunt	12	19	2	13
Bedding	49	78	12	80
barren	15	24	1	7
Agrofirma AKAS LLP				
Selected and carried out inseminations	31	100	21	100
Repeated hunt	6	19	2	10
Bedding	28	90	20	95
barren	3	10	1	5

Table 10. The scheme of the diet in the experimental period.

Feed types	Group		Month of lactation, month	Lactation by account
	Control (n=10)	experienced (n=10)		
Hay forbs (pastures), kg	15	15		
Crushed barley, kg	5	5	1	2
Vitamin and mineral premix, g	-	150		

yalovye – 1 goal, or 7%. In LLP "Agrofirma "AKAS" 52 heads were inseminated with same-sex seed. cows (31) and heifers (21), of which cows: 16 heads, or 19%, came to the second hunt, pregnant – 28 heads. or 90%, yalovy – 3 goals. or 10%; for heifers: 2 goals came to the second hunt, or 10%, pregnant – 20 goals, or 95%, yalovye – 1 goal, or 5%.

Research work on the study of ways to increase the conversion of nutrients and the productive effect of feed in dairy cattle breeding in various zones of Kazakhstan was carried out in the Anisan farm.

When studying the feeding ration in the Anisan farm, work is carried out monthly to analyze the chemical composition of feed.

In order to conduct a zootechnical experiment to adjust rations, 20 heads of dairy cows of the Holstein black-and-white breed were selected, divided into experimental (n=10) and control (n=10) groups by the method of pairs of analogues, taking into account age, productivity (live weight, daily milk yield) and physiological condition.

For all groups of experimental animals, diets were compiled that were identical in basic nutrients and corresponded to detailed feeding standards for farm animals. All experimental animals were kept in the same conditions. The animals were fed in the evening after milking. The duration of the experiment was 120 days.

The scheme of the diet in the experimental period is presented in Table 10.

From the data in Table 10, the feeding ration of the control group consists of an economic ration, including natural hay and concentrate in the form of granulated barley, and the feeding ration of the experimental group consists of an economic ration with the addition of a vitamin-mineral premix developed by us of 150 g per head.

According to the chemical analysis, the difference in the nutritional value of feed between the norm and the existing diet was calculated.

For indicators of the feeding rate, data were taken from the source "Norms and feeding rations of farm animals, 3rd edition, revised and supplemented, Moscow, 2003", and the structural calculation of the household ration was carried out using the methodological recommendation "Methodology for calculating the exchange energy in feed based on the content of raw nutrients", Dubrovitsy, 2008.

A comparison of the household diet with the feeding rate of full-aged dairy cows with a live weight of 400 kg is presented in Table 11.

The analysis of the data presented in Table 11 shows that the difference between the reference norm and the household ration has been determined, which means that the feeding ration of the farm corresponds to the norm of 15 kg of milk yield per head per day.

To enrich the feeding diet with vitamin and mineral substances, the proposed premix will act as an activator of enzymes and structural elements in all metabolic processes that are involved in the metabolism of proteins, carbohydrates, fats, water regime and hormonal functioning of the body. To prevent the deficiency of minerals, including macro-trace elements, vitamins, this vitamin and mineral premix is selected according to the physiological state and productive indicators of animals. Mineral deficiency can

lead to a decrease in milk yield, digestibility of feed and deterioration of reproductive qualities.

Vitamin and mineral premix for dairy cows, characterized by the fact that it includes vitamins, minerals, including macro-microelements, differs in that the premix includes components in the following ratio (Table 12).

It follows from Table 12 that the vitamin–mineral premix developed by us is characterized by the fact that it includes vitamins, minerals, including macro-microelements. The premix also includes components in the following ratio: phosphorus (P) – 5% of monocalcium phosphate, vitamin A – 1.2% of rovimix A 1000, vitamin D3 – 0.64% of rovimix D3, vitamin E – 16% of rovimix E-50, manganese (Mn) – 22.2%, copper (Cu) – 9%, zinc (Zn) – 19%, iodine (I) – 0.28%, selenium (Se) – 7.65 and cobalt (Co) – 0.14%, and feed chalk – 5% and chickpea flour – 13.89% are used as fillers as a source of calcium (Ca). (Table 1).

In the farm "Anisan", a zootechnical analysis of pasture grass and crushed barley is carried out monthly, which means that during the study period, protein in pasture grass was 9.2%, fat 2.7%, fiber 31.63%, ash 10.19%, sugar 3.41%, carotene 6.72 g, Ca 1.04 and P – 0.25%, in crushed barley protein – 14.6%, fat – 2.7%, fiber – 6.65%, ASH – 3.05%, starch - 46.67%.

The productive indicators of the Holstein black-and-white breed of the "Anisan" farm are presented in Table 13.

According to Table 13, the average daily milk yield at the beginning of the experiment in both study groups was in the range of 10.6-10.8 kg. At the end of the experiment, the average daily milk yield in animals receiving premix exceeded their peers from the control group by 1.4 kg or 1.6%.

According to the chemical composition of milk, the indicators of fat, protein and lactose were higher in the cows of the experimental group compared with the peers of the control group (for fat – 3.92>3.37, for protein – 3.32>3.23, for lactose - 4.16>4.01).

Thus, the feeding ration of the control group consists of an economic ration, including natural hay and concentrate in the form of granulated barley, and the experimental group consists of an economic ration with the addition of a vitamin and mineral premix developed by us of 150 g per head. the difference between the reference norm and the household ration has been determined, from which it follows that the feeding ration of the farm corresponds to the norm of 12 kg of milk yield per head per day. The vitamin and mineral premix developed by us includes vitamins, minerals, including macro-microelements. The premix also includes components in the following ratio: phosphorus (P) – 5% of monocalcium phosphate, vitamin A – 1.2% of rovimix A 1000, vitamin D3 – 0.64% of rovimix D3, vitamin E – 16% of rovimix E-50, manganese (Mn) – 22.2%, copper (Cu) – 9%, zinc (Zn) – 19%, iodine (I) – 0.28%, selenium (Se) – 7.65 and cobalt (Co) – 0.14%, and feed chalk – 5% and chickpea flour – 13.89% are used as fillers as a source of calcium (Ca).. The average daily milk yield at the beginning of the experiment in both study groups was in the range of 10.6-10.8 kg. At the end of the experiment, the average daily milk yield in animals receiving premix exceeded their peers from the control group by 1.4 kg or 1.6%. According to the chemical composition of milk,

Table 11. Comparison of the economic diet of dairy cows with the feeding rate of full-aged dairy cows with a live weight of 400 kg, 12 kg of milk yield per head per day.

Indicators	Daily milk yield with a fat content of 3.8-4.0%		
	Household ration	Standard	Difference
EKE	11.9	11.7	0.2
OE, MJ	119	117	2
Dry matter, kg	14.5	12.5	2.0
Crude Protein, g	1568	1540	28
Digestible Protein, g	1019	1000	19
RPg	1065	1046	19
NRP, g	503	494	9
Raw fiber, g	3431	3480	- 49
Starch, g	1567	1300	267
Sugar, g	866	880	-14
Crude fat, g	388	310	78
Table salt, g	66	68	-2
Calcium, g	62	68	-6
Phosphorus, g	55	48	-3
Magnesium, g	21	19	2
Potassium, g	74	74	0
Sulfur	no data	24	no data
Iron, mg	no data	880	no data
Honey, mg	no data	87	no data
Zinc, mg	no data	580	no data
Cobalt, mg	no data	6.6	no data
Manganese, mg	no data	580	no data
Iodine	no data	7.6	no data
Carotene	649	459	190
Vit D	no data	10	no data
Vit E	no data	400	no data

Table 12. Formulation of vitamin and mineral premix for dairy cows used in Anisan farm.

Name of components	The content of components in the premix, g/kg	The content of the components in the premix, %
Phosphorus (P) from monocalcium phosphate	50	5
Vitamin A from rovimix A 1000	12	1.2
Vitamin D3 from rovimix D3	6.4	0.64
Vitamin E from rovimix E-50	160	16
Manganese (Mn)	222	22.2
Copper (Cu)	90	9
Zinc (Zn)	190	19
Iodine (I)	2.8	0.28
Selenium (Se)	76.5	7.65
Cobalt (Co)	1.4	0.14
Filler: Feed chalk (Ca)	50	5
Chickpea flour	138.9	13.89
Total:		100

Table 13. Productive indicators of the Holstein black-and-white breed "Anisan" farm.

Group	Number of goals	Average daily milk yield, kg	Fat, %	Protein, %	Lactose, %	KSK, thous.
At the beginning of the experience						
Control	10	10.8±3.12	3.32±2.43	2.93±1.34	4.01±1.45	392±7.65
Experienced	10	10.6±2.98	3.29±1.98	2.97±1.56	4.01±1.76	389±6.99
At the end of the experience						
Control	10	12.3±3.45	3.37±2.03	3.23±1.76	4.01±1.54	467±7.32
Experienced	10	13.7±3.11	3.92±2.76	3.32±2.01	4.16±1.31	401±7.43

the indicators of fat, protein and lactose were higher in the cows of the experimental group compared with the peers of the control group (for fat – 3.92>3.37, for protein – 3.32>3.23, for lactose - 4.16>4.01).

4. Conclusions

1. The visual analog scale of qualitative assessment of behavior (VAS) met the criteria by season: in spring and autumn, the activity of cows decreases to 35%, in summer it increases to 44%, the number of "frightened" heads in spring is 22%, in summer and autumn their number decreases to 10%, the number of "irritable" and "restless" cows in spring and autumn is 20%, in summer the indicator drops to 11%. The proportion of "atypical" cows in all seasons of time did not exceed 5%, the number of "upset" cows in spring showed 33%, in summer and autumn 24%. The results of observation of social behavior and cough: in the standing position in the spring and autumn from 17 to 26 heads, in the summer the number of "standing" cows is up to 10 heads. Taking food and drinking in the spring time of 31 heads, in the summer and autumn time amounted to 46 heads. The "lying down" of animals in spring and autumn was up to 5 heads, in summer up to 7 heads. Indicators of the "agonistic" behavior of animals: the "headbutt" of animals in all seasons amounted to up to 5 heads of cows, as well as the "chase, pursuit" in herds varies up to 7 heads. The movement of animals in herds in spring is increased to 21 heads, and in summer and autumn it is reduced to 11 heads. The "fight" of animals in the herds in the spring is observed up to 12 heads and decreases to 3 heads of cows in the remaining seasons of the year. There was no cough in the herd during the studies. The condition of the limbs, sides, udders of cattle is clean according to the point system "0" in spring and summer time significantly increases to 53 heads, and in autumn time decreases to 31 heads, also the condition is dirty "2" in spring and summer time up to 14 heads, and in autumn time up to 30 heads. According to the skin, the absence of wool in all seasons varies from 4 to 8 heads, injuries are flattened, wrists from 4 to 7 heads, lameness from 3 to 5 heads. Neck/shoulder blade/back injuries – up to 5 cows in herds. During the observation, 9 cows suffered from dystocia in the last 12 months, the diagnosis of cow paresis in

the last 12 months was observed in 11 heads. Nasal and ocular discharge, shortness of breath – 3 goals. Animals are not subjected to pruning of horn appendages / decontamination on the farm and trimming of tails.

2. In the farm "Anisan" animals in the summer are on pasture, after evening milking in the paddock, fed with crushed barley, 4 kg per head per day. During the stall period, the feeding ration consists of hay of various grasses and crushed barley. The feeding ration of cows in the Esbol farm includes corn silage, alfalfa hay, bran. Animals are also in the pasture during the summer during the daytime, in the evening they are driven into special pens, after milking the animals are fed with concentrated feed (4 kg per head per day). During the stall period, the feeding ration consists of silage, alfalfa hay and various grasses, bran. Average productivity indicators of cows in the studied period by technological groups: "high–yielding cows" fatness, BSC – 2.83, average pregnancy day – 288.5 days, lactation age – 2.34, age of the first calving - 41.1 months, interbody interval – 313 days. The average live weight of a calf at birth is 34 kg. The average productivity of milk yield per herd is 13.4 kg, milk quality indicators for fat – 3.96%, protein – 3.11%, lactose – 4.2%, urea – 17.9%, KSK – 480.9 thousand.; "low–fat cows": fatness, BSC – 2.81, average pregnancy day - 287.3 days, lactation age – 2.72, age of the first calving – 41.3 months, interbody interval – 352.3 days. The average live weight of a calf at birth is 34 kg. Average milk yield per herd – 7.03 kg, milk quality indicators for fat – 4.02%, protein – 3.16%, lactose – 4.23%, urea – 16.1%, KSK – 482.1 thousand; "dry cows": fatness, BSC – 3.33, average pregnancy day – 288.13 days, lactation age – 3.11, the age of the first calving is 41.7 months, the interbody interval is 347.5 days. The average live weight of a calf at birth is 34 kg. In the diet of cows of the KH "Anisan", the dry matter content of the technological group "dry cows" was 15.4 kg, in highly productive and low–productive cows 14.5 kg, also similar indicators were 136 and 119 MJ, digestible protein - !227 g and 1305 g, crude fiber 4164 g and 3310 g, NDK – 8002 g and 7073 g, ADC – 5159 g and 4054 g, respectively.

3. During the gynecological examination, the following were determined: in the Anisan farm (n=153), the main and predisposing etiological factors of infertility of cows, while with pathology of the genitals 44 heads – 29%, pregnant 42 heads - 27% and without pathologies 67

heads - 44% of cows; in the farm "Esbol" (n=193) the main and predisposing etiological factors of infertility of cows, with pathology of the genitals 76 – 39%, pregnant 34 – 18% and without pathologies 83 – 43%; in LLP "AF " AKAS" (n=154) the main and predisposing etiological factors of infertility of cows, with at the same time with pathology of the genitals 34 goals. - 22%, pregnant 67 heads. – 44% and without pathologies 53 heads. - 34% of cows. Based on comprehensive diagnostic studies of gynecological diseases in the cows studied, it was established: in Agrofirma Akas LLP: endometritis – 3 goals, persistent yellow body – 3 goals, uterine subinvolution – 9 goals, ovarian hypofunction – 6 goals, vulvitis – 9 goals, ovarian cyst – 4 goals; in the EC "Esbol": uterine subinvolution – 20 goals, vulvitis and vestibulovaginitis – 16 goals, endometritis - 15 goals, ovarian hypofunction – 13 goals, follicular cyst – 4 goals, persistent yellow body - 8 goals.; in the Anisan farm: endometritis – 7 goals, persistent yellow body – 6 goals, uterine subinvolution – 13 goals, vulvitis - 8 goals, cyst – 10 goals. In the Esbol farm, 40% were treated, Anisan Farm - 29%, AF AKAS LLP - 34% of the total livestock. All the livestock that underwent treatment was successfully cured. 150 heads of cows and heifers were inseminated with the same–sex seed, of which 20 heads were in the Esbol farm, 52 goals were in the AKAS AF LLP, 78 goals were in the Anisan Farm. The same-sex seed of the Simmental breed of the WAYNE DE 09 463 75031 bull was used in the Esbol farm. In the LLP "AF "AKAS" and the farm "Anisan", the same-sex seed of the Holstein black-and-white breed of the bull-producer AltaRECOIL 011HO11736 was used. in the farm "Esbol", 20 heads were inseminated with the same-sex seed. cows, of which 2 heads, or 10%, came to re–hunt, pregnant - 15 heads, or 75%, yalovye – 3 heads, or 15%. In the Anisan farm, 78 heads of cows (63 heads) and heifers (15 heads) were inseminated with same-sex seed, of them by cows: 12 heads, or 19%, came to re-hunt, pregnant – 48 heads. or 78%, yalovy – 15 goals. or 24%; according to the heifers: 2 goals, or 13%, pregnant – 12 goals, or 80%, yalovye – 1 goal, or 7% came to the second hunt. In LLP "Agrofirma "AKAS" 52 heads were inseminated with same-sex seed. cows (31) and heifers (21), of which cows: 16 heads, or 19%, came to the second hunt, pregnant – 28 heads. or 90%, yalovy – 3 goals. or 10%; for heifers: 2 goals came to the second hunt, or 10%, pregnant – 20 goals, or 95%, yalovye – 1 goal, or 5%.

4. The feeding ration of the control group consists of an economic ration, including natural hay and concentrate in the form of granulated barley, and the experimental group consists of an economic ration with the addition of a vitamin and mineral premix developed by us of 150 g per head. The difference between the reference norm and the household ration has been determined, from which it follows that the feeding ration of the farm corresponds to the norm of 12 kg of milk yield per head per day. The vitamin and mineral premix developed by us includes vitamins, minerals, including macro-microelements. The premix also includes components in the following ratio: phosphorus (P) – 5% of monocalcium phosphate, vitamin A – 1.2% of rovimix A 1000, vitamin D3 – 0.64% of rovimix D3, vitamin E – 16% of rovimix E-50, manganese (Mn) – 22.2%, copper (Cu) – 9%, zinc (Zn) – 19%, iodine (I) – 0.28%, selenium (Se) – 7.65 and cobalt (Co) – 0.14%, and feed chalk – 5% and chickpea flour – 13.89% are used as fillers as a source of calcium (Ca).. The average daily milk yield at the beginning of the experiment in both study groups was in the range of 10.6-10.8 kg. At the end of the experiment, the average daily milk yield in animals receiving premix exceeded their peers from the control group by 1.4 kg or 1.6%. According to the chemical composition of milk, the indicators of fat, protein and lactose were higher in the cows of the experimental group compared with the peers of the control group (for fat – 3.92>3.37, for protein – 3.32>3.23, for lactose - 4.16>4.01).

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