

Breeding Young Kazakh White-headed Cattle in Different Calving Seasons

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ABSTRACT

This research was carried out in the breeding farms of the West Kazakhstan region (Aisulu farm, Hafiz farm, Dongelek farm and Plemzavod Chapaevsky LLP). The object of the study was to obtain the young cattle of Kazakh white-headed breed from cows in different calving seasons. Using modern methods of economic analysis in the agro-industrial complex and predicted economic efficiency indices, the authors determined the economic efficiency of raising young animals depending on the calving season. The study of growth and development of young stock was carried out monthly by weighing the calves in the morning before feeding and drinking. Based on the weighing results, the authors determined the following parameters of the productivity of young animals : the live weight of heifers and bulls of the Kazakh white-headed breed of different birth seasons; average daily weight gain of young animals; the features of the exterior and constitution of the young cattle were studied by taking basic measurements of the physique and calculating the physique indices based on them. The data obtained indicated that each farm was characterized by specific conditions for calving according to the seasons of the year, which must be taken into account when organizing herd reproduction and scheduling of mating, insemination and calving.

Key words : Average daily gain, calving season, economic efficiency, Kazakh white-headed breed, live weight

INTRODUCTION

In beef cattle breeding to date, there is no consensus about the optimal timing of calving by seasons of the year (Tamarovsky *et al.*, 2017). With seasonal calving, the formation of young stock into homogeneous groups is facilitated, premises are used more economically during the period of stall keeping, and organizing herds for grazing becomes more convenient. The presence of large, homogeneous lots of livestock facilitates the sale of the cattle for meat or as live animals (Amanzholov *et al.*, 2017).

Increasing the live weight of heifers at 15-17 months of age to inseminate them in May-July is a feasible task, at least for 60-70% of animals born in the winter-spring season. For this, the weight gain for the entire growing period must be at least 700 g/day. The weight of heifers for weaning should be 180 to 200 kg, for going to pasture after wintering around 290 kg, after two months of grazing, that is, in June, around 340 kg (with an average daily weight gain of 800 g for this period). To ensure such development, it is necessary to introduce

alfalfa hay, oilseed feed and mixed feed with protein components into winter rations (Shubina and Gorelik, 2016).

The benefits of spring calving are evidenced by the fact that pasture productivity becomes maximum at the time when the cow's need for nutrients reaches the highest value and there is enough pasture grass to meet these needs without additional feeding. In farms engaged in breeding cattle of beef breeds, the seasonality of calving cows in different herds is far from unambiguous. On an average, calving in farms over several years is distributed as follows : 59% of calves are born from December to May (during the winter and spring seasons), 29% are born from June to August (in summer), 12% are born from September to November (in the autumn). In breeding farms, these numbers equal 75, 15 and 10%, respectively.

The formation of meat productivity of animals is determined by the supply of feed, its quality and preparation for feeding by 59%. The share of cultivation technology, maintenance and reproduction accounts for 17%, and the level of selection determines productivity by 24%.

However, if it is not customary to sell young animals earlier than 10 months of age on the farm, then it is still better to opt for autumn calving. Another reason for calving in the autumn is the higher market prices for young stock sold in the spring, as their numbers are much smaller at this time of year. On the other hand, autumn calving in most cases is undesirable, since, to maintain lactation in cows whose nutrient requirements are almost doubled compared to the need for dry cows with calves; large amounts of additional feed are required for the winter stall period (Lebedko, 2017).

The productivity of animals is formed in the first stages of ontogenesis. The productive qualities of cows depend on the nature of growth and development, the level of growth of heifers at a young age, and their rational use in reproduction. In turn, the growth of young animals is conditioned by many factors, primarily by nutrition and maintenance. The influence of factors associated with the calving seasons of cows, the age of calves at weaning from their mothers, and the level of feeding during the rearing process on the growth and development of young stock has a certain pattern. During the calendar year, growth rates are greatly influenced by changes in the technological processes of cultivation by seasons or due to the age of animals. Moreover, the nature of changes in the conditions of the external environment is adequate for the reaction of the organism being negative in case of abrupt changes and positive in case of a gradual change of conditions (Smirnova *et al.*, 2016).

The traditional technology of beef cattle breeding is based on the extensive use of natural forage lands. Therefore, in all countries where this industry is widespread, seasonal calving is mainly practised. When breeding beef cattle in stall conditions throughout the year, in particular in the south-eastern zone of Ukraine, where intensive types of beef cattle have been created, due to the lack of pastures, there is no need to adhere to a strict seasonality of calving. Nevertheless, in the scientific literature, there is no sufficiently substantiated data on this matter (Rodionov *et al.*, 2017).

It was proposed to use in beef cattle breeding of calving in two rounds, namely, winter-spring and autumn, as well as uniform calving of cows

throughout the year, since this contributes to the more rational use of production facilities, allows the production of beef in line, and, therefore, ensures the rhythmic work of enterprises of the meat-processing industry (Nikonova *et al.*, 2018; Dabuzova *et al.*, 2019; Gorlov *et al.*, 2019a, b; Selionova *et al.*, 2019).

MATERIALS AND METHODS

All research was carried out under the working research program approved by the Coordination Council of the Zhangir Khan West Kazakhstan Agrarian and Technical University NJSC entitled "Research plan and methods under the program 'Increasing the efficiency of breeding methods in cattle breeding'" (Protocol No. 2 dated 19.10.2018). The research was carried out in the breeding farms of West Kazakhstan (WK) (Aisulu farm, Hafiz farm, Dongelek farm, Plemzavod Chapaevsky LLP). The object of the study was the young cattle of Kazakh white-headed breed obtained from cows in different calving seasons.

Experimental studies and maintenance of animals were carried out considering the instructions and recommendations of Russian Regulations, 1987 (Order No. 755 of the USSR Ministry of Health dated 12.08.1977) and "The Guide for Care and Use of Laboratory Animals" (National Academy Press Washington, DC 1966). In the course of our research, everything possible was done to ensure a minimum of animal suffering and to reduce the number of prototypes studied. The study of growth and development of young stock was carried out monthly by weighing the calves in the morning before feeding and drinking. Based on the weighing results, authors determined the following parameters of the productivity of young animals: the live weight of heifers and bulls of the Kazakh white-headed breed of different seasons of birth; average daily weight gain of young animals. Authors studied the features of the physique and constitution of the young cattle by taking basic measurements of the physique and calculating the physique indices based on them.

The economic efficiency of rearing young animals, depending on the calving season, was determined using modern methods of economic analysis in the agricultural sector and predicted economic efficiency indices. The economic efficiency of rearing young animals

in different calving seasons was assessed using the following parameters : average daily live weight gain in g (livestock production per head per day). This parameter was determined by dividing the gross weight gain by the number of days in the period of keeping animals. Absolute weight gain was determined in kg and was calculated by subtracting the animal's weight at the beginning of the period from its live weight at the end of the period. The cost of 1 cm of livestock live weight gain in tonnes was determined by calculating the costs, or according to the data of process sheets.

RESULTS AND DISCUSSION

The work was carried out at the Aisulu farm, the Hafiz farm, the Dongelek farm and the Chapaevsky Plemzavod LLP in WK. Young cattle of the Kazakh white-headed breed of the afore mentioned farms were kept together in pasture conditions with the mothers before weaning. After weaning, the calves were kept loosely, on deep, permanent bedding in winter. The results of changes in the live weight of young breeder animals depending on the seasons of birth are presented in Tables 1-4. In the Dongelek farm, two calving seasons were practised, winter and early spring (Table 1). Winter calving bulls at 8-12 months of age exceeded their spring calving peers in live weight by 1.6 and 6.1 kg, respectively, while

at 15 months of age the advantage belonged to the spring calving bulls, and the difference equalled 7.1 kg. No significant differences in live weight were observed in heifers of winter and spring calving. A comparison of the live weight of bull calves of different farms at 15 months of age showed a slight advantage of the young animals of the Aisulu farm and the Dongelek farm, born both in spring and autumn calving.

The spring calving bulls in the period from birth to 15 months of age had a high average daily weight gain, equalling 996.1 g at the Aisulu farm and 972.3 g at the Dongelek farm (Table 2).

It was seen that the differences in the live weight of bulls and heifers at the age of 15 months were insignificant (Table 3). The average daily weight gain of bulls in the period from birth to 15 months was 823.2 g and in heifers 503.6 g (Table 4). In terms of average daily gain, a slight advantage was observed in bulls of the winter calving season over their peers born during spring calving. A similar pattern was also observed in heifers.

The economic efficiency of raising and feeding young cattle was determined by the selling price, the profit and the level of profitability. Therefore, in the course of the studies, the profit and profitability were calculated of raising young animals born in different calving seasons at farms based on the cost of selling

Table 1. The dynamics of change in live weight of young breeder animals of the Kazakh white-headed breed born in different calving seasons at the Dongelek farm (kg)

| S. No. | Season of birth | 8 months | 12 months | 15 months |
|----------------|-----------------|------------|------------|-----------|
| | | M±m | M±m | M±m |
| Bulls | | | | |
| 1. | Spring | 236.6±2.30 | 325.3±2.60 | 413.7±4.0 |
| 2. | Winter | 238.2±1.01 | 331.4±1.20 | 406.6±3.0 |
| Heifers | | | | |
| 3. | Spring | 216.6±4.3 | 292.5±1.9 | 317.5±1.3 |
| 4. | Winter | 215.9±2.1 | 291.7±1.6 | 315.7±2.1 |

Table 2. The dynamics of changes in live weight of young breeder animals of the Kazakh white-headed breed born in spring calving season in the Aisulu farm and the Hafiz farm (kg)

| S. No. | Gender of the animal | 8 months | 12 months | 15 months |
|--------------------|----------------------|-----------|-----------|-----------|
| | | M±m | M±m | M±m |
| Aisulu farm | | | | |
| 1. | Bulls | 239.5±1.7 | 333.2±1.3 | 416.6±4.4 |
| 2. | Heifers | 213.9±0.5 | 289.9±0.6 | 315.2±2.2 |
| Hafiz farm | | | | |
| 1. | Bulls | 222.1±1.1 | 316.7±1.7 | 392.9±4.0 |
| 2. | Heifers | 206.3±1.1 | 286.0±1.2 | 310.5±1.3 |

Table 3. The dynamics of change in live weight of young breeder animals of the Kazakh white-headed breed born in winter calving season at Plemzavod Chapaevsky LLP (kg)

| S. No. | Gender of the animal | 8 months | 12 months | 15 months |
|--------|----------------------|-----------|-----------|-----------|
| | | M±m | M±m | M±m |
| 1. | Bulls | 223.7±1.1 | 315.3±1.5 | 390.8±3.2 |
| 2. | Heifers | 213.6±0.7 | 285.4±0.7 | 307.0±2.0 |

Table 4. The average daily weight gain of young Kazakh white-headed breed born in different calving seasons (g)

| Name | Gender of the animals | Calving season | | | | | |
|----------------|-----------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | | 0-8 | | 8-12 | | 8-15 | |
| | | Spring X±Sx | Winter X±Sx | Spring X±Sx | Winter X±Sx | Spring X±Sx | Winter X±Sx |
| Aisulu farm | Bulls | 906.4±12.1 | - | 992.0±29.2 | - | 928.8±20.7 | - |
| | Heifers | 795.3±7.2 | - | 633.7±9.4 | - | 484.4±5.9 | - |
| Dongelek farm | Bulls | 894.7±14.5 | 899.7±10.7 | 753.2±12.8 | 777.1±1.45 | 867.3±24.9 | 795.8±9.8 |
| | Heifers | 819.0±7.9 | 814.2±10.5 | 652.2±9.2 | 631.9±15.4 | 483.3±8.4 | 476.5±11.9 |
| Hafiz farm | Bulls | 289.7±10.5 | - | 710.6±11.2 | - | 808.6±22.1 | - |
| | Heifers | 763.3±7.9 | - | 664.1±10.7 | - | 482.0±4.1 | - |
| Plemzavod | Bulls | - | 820.9±8.3 | - | 695.9±33.9 | - | 823.2±12.9 |
| Chapaevsky LLP | Heifers | - | 741.8±9.6 | - | 583.1±9.4 | - | 503.6±10.1 |

experimental animals and production costs (Table 5).

The analysis of parameters of the economic efficiency of rearing young stock in the studied farms under the age of 15 months showed that the most profit was gained by rearing young cattle of spring birth (44.07%), while rearing young cattle born during the winter calving gave less profit (37.69%) at the Dongelek farm. This was primarily due to the higher average live weight of the young stock in the spring birth season and the lower costs. An analysis of the economic efficiency of rearing young animals born in different calving seasons

showed different economic parameters for a particular farm. At the Dongelek farm, it was more profitable to raise young calves born in the spring season than in the winter, and the level of profitability was higher by 16.9%. The highest profitability of rearing young animals was observed in the spring season of calving at the Aisulu farm (49.51%). In Plemzavod Chapaevsky LLP the profitability equalled 35.24%, while the Hafiz farm had the lowest profitability of the spring calving season (29.10%).

In specialized beef cattle breeding, the organization and conduct of seasonal calving

Table 5. The economic efficiency of raising young animals born in different calving seasons

| S. No. | Parameters | Aisulu farm | Dongelek farm | Hafiz farm | Plemzavod Chapaevsky LLP |
|--------|---|-------------|---------------|------------|--------------------------|
| | | Spring | Winter | Spring | Spring Winter |
| 1. | No. of young animals, heads of cattle | 36.0 | 66.0 | 15.0 | 82.0 |
| 2. | Including bulls | 19.0 | 23.0 | 7.00 | 11.0 |
| 3. | Heifers | 17.0 | 43.0 | 8.00 | 71.0 |
| 4. | Live weight of bulls at 15 months (kg) | 416.6 | 406.6 | 413.7 | 392.9 |
| 5. | Live weight of heifers at 15 months (kg) | 315.2 | 315.7 | 317.5 | 310.5 |
| 6. | Production costs ('000 t) | 5770.8 | 10823.1 | 2452.6 | 13,276 |
| 7. | Costs/head of cattle from birth to 15 months ('000 t) | 160.30 | 163.99 | 163.51 | 161.90 |
| 8. | Cost/cm of weight gain ('000 t) | 46.30 | 50.25 | 52.25 | 54.20 |
| 9. | Cost/cm of live weight ('000 t) | 43.48 | 47.21 | 45.12 | 50.35 |
| 10. | Average selling price in live weight/kg ('000t) | 0.65 | 0.65 | 0.65 | 0.65 |
| 11. | Revenue from sales ('000 t) | 8627.9 | 14902.5 | 3533.3 | 17138.0 |
| 12. | Profit ('000 t) | 2857.1 | 4079.35 | 1080.8 | 3862.8 |
| 13. | Level of profitability (%) | 49.51 | 37.69 | 44.07 | 29.10 |

are of great importance. Seasonal calving, as a rule, is closely interconnected with the peculiarities of the natural and climatic conditions in which the farms operate, fodder resources, adopted technologies for keeping livestock, economic opportunities, material and technical base, human resources (personnel), and, ultimately, consumer demand. Research on the rearing of young stock born in different seasons was carried out in leading farms for cattle breeding of the Kazakh white-headed breed. It should be noted that in the farms practising the same calving seasons, different results of the performance indicators of young animals were obtained.

Thus, in terms of live weight at the age of 15 months, the bulls of the Kazakh white-headed breed of spring calving at the Aisulu farm exceeded their peers of the Hafiz farm by 23.7 kg and the heifers by 4.7 kg. The differences in their live weight compared to the young cattle at the Dongelek farm were insignificant. Both bulls and heifers born during the winter calving season at the Plemzavod Chapaevsky LLP were inferior in terms of live weight to their peers born during winter and spring calving at other farms. More noticeable differences in live weight were observed in young animals of different birth seasons. Both bulls and heifers born in spring exceeded their peers born in the winter season by 7.1 and 1.8 kg, respectively, at the age of 15 months. The average daily gain in live weight for the age of 8-15 months was the highest in young calves born during the spring season.

The data obtained from the study of the economic efficiency of rearing young animals born during different calving seasons showed ambiguous results in the context of farms. The obtained materials are consistent with the results of studies published by Kazakh and foreign scientists.

The economic and biological characteristics of animals are determined by the results of the interaction of heredity and conditions of individual development. The entire set of life processes in animals consists of the subtlest interactions between the genotype and the environment. It can be assumed that the seasonality of calving is one of the factors influencing the processes of interaction between the genotype and the environment since animals, depending on their nature and hereditary characteristics, require appropriate

conditions. The choice of the most rational technology for keeping and feeding, considering the seasonality of calving, requires scientific justification. This issue must be addressed specifically for each climatic zone. Many authors believed that this should imply considering not only technological and economic parameters but also the permissible limits of physiological fluctuations of individual constants of the body (Nassambaev *et al.*, 2018; Shlykov *et al.*, 2018; Tarantola *et al.*, 2020).

When planning the choice of the seasonality of calving, it should be borne in mind that animals, depending on the breed, individual and hereditary characteristics, require appropriate conditions. At the same time, to realize the potential of productivity for animals of different birth seasons, it is necessary that the needs for nutrients and energy be fully satisfied at all stages of growth of the development of the animal. This statement is conditioned by the fact that in ontogeny the animal's organism goes through several stages of development, with each stage having its characteristics. It should be noted that young growing animals are most sensitive to environmental conditions.

In many regions of Russia, from an economic point of view, in beef cattle breeding, it is profitable to obtain offspring seasonally, in winter and early spring periods. It is believed that this makes it possible to improve technology and increase the safety of young animals. Calves obtained during this period, with the transfer of animals to summer housing, can use pasture feed and an abundance of mother's milk, which contributes to obtaining high gains in live weight without large material costs for feed both in winter and in spring. The winter and early spring calving influences the preparation for the next fertilization of cows favourably. When planning calving in winter (January) and early spring (March) periods, it is necessary to keep in mind that farms must be provided with good pastures and have a stable forage base in the winter stall period.

In farms with a shortage of livestock housing, the calving dates can be shifted to the late spring period (April to May). In such cases, the cows enter the wintering pregnant, without calves, which allows them to be kept in light-type buildings with fewer labour costs. Winter/

spring calving against the background of inadequate and insufficient feeding affects the preservation of the offspring and the subsequent readiness of cows for fertilization, especially first-calf heifers, in a negative way. In this regard, cows and heifers should receive adequate feed during mating, pregnancy and after calving (Shlykov *et al.*, 2018; Dabuzova *et al.*, 2019; de Rezende *et al.*, 2020; Tarantola *et al.*, 2020).

One of the conditions for choosing a calving season in farms is the knowledge of the production cycle for obtaining young breeder animals. In this regard, it should be noted that at most farms in WK, livestock breeding, as a rule, is carried out with a full turnover of the herd, that is, the entire production cycle for obtaining young breeder animals is limited by the framework of one farm, which determines the determination of the optimal calving of breeder cows. Analyzing the production data on the Angus breed breeding, it was concluded that the optimal dates for the birth of young breeder animals were the winter and early spring periods, which was partially consistent with the data obtained in our studies. At the same time, it is noted that in the absence of conditions for intensive rearing, summer calving is possible, which also contributes to obtaining high-quality young animals with maximum use of pastures. The parameters of the live weight dynamics, average daily weight gain and economic efficiency allowed us to conclude that the choice of the calving season in each farm should be determined considering the specific conditions and capabilities of this farm (de Rezende *et al.*, 2020).

CONCLUSION

1. The Dongelek farm practises two calving seasons, namely, winter and early spring. Winter calving bulls at 8-12 months of age exceeded their spring calving peers in live weight by 1.6 and 6.1 kg, respectively, while at 15 months of age the advantage belonged to the spring calving bulls, and the difference equalled 7.1 kg. In heifers born during the winter and spring calving, no significant differences were observed in live weight.
2. The comparison of the live weight of

bull calves at 15 months of age at different farms showed a slight advantage of young animals of the Aisulu farm and Dongelek farm, born both in spring and in autumn calving.

3. The obtained data indicated that each farm was characterized by specific conditions for calving according to the seasons of the year, which must be taken into account when organizing the reproduction of the herd and drawing up a schedule of mating, insemination and calving.

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