Productivity of young cattle of the Kalmyk breed with stable-pasture technology of cultivation

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Abstract. The authors conducted a comparative analysis of growth energy indicators and dynamics of live weight of young Kalmyk breed at different levels of feeding during the suckling period. It is shown that during the entire period of cultivation, the consumption of metabolic energy in experimental bulls was 4000 MJ and 50 kg of digestible protein more than in peers of the control group. Additional feeding of suckling calves provided an advantage in the average daily growth in bulls by 70 g, and in heifers by 38 g per head per day. From the bulls of the experimental group, which have higher live weight indicators and a lower cost of 1 kg of growth than their peers in the control group, but with the same selling cost of 1 kg of live weight, 56.1% more profit was obtained and 5.3% higher profitability.

1. Introduction

Sustainable self-sufficiency of the population with high-quality food at the expense of its own production is one of the most important conditions for the stability of individual regions and the country as a whole. Their self-sufficiency is determined by the level of satisfaction of the needs of industry in raw materials, and the population in food. In recent years, in Russia and including in the Rostov region, more than 80% of beef is produced at the expense of dairy cattle breeding and until 1990 it was produced 26-29 kg per capita. In the process of introducing a market economy and a sharp reduction in the number of cattle, beef production decreased in Russia and in the Rostov region to 14-18 kg per capita. Although according to the rational norms recommended by the Institute of Nutrition of the Russian Academy of Medical Sciences, 320-340 kg of milk and 25 kg of beef are needed per capita per year [1-6].

In order to increase the production of beef, various state sectoral programs developed and adopted for implementation provide for the intensification of the cultivation of young animals and an increase in the number of livestock of specialized meat breeds. In order to create a large-scale beef cattle industry that can significantly increase beef production in the future. Based on the use of imported and well-adapted to the harsh arid regions of animals of Kalmyk, Kazakh white-headed and Russian Komola breeds. They account for more than 65% of the number of cattle of meat breeds in Russia [7-8]. At the same time, the most high-quality beef containing polyunsaturated omega 3 and omega 6 fatty acids in a ratio of 1:4 is obtained from animals raised with stall-pasture technology [9-10].
aim of the work was to conduct a comparative assessment of the formation of meat productivity of young Kalmyk breed at different intensity of cultivation in the suckling period in the conditions of stall-pasture technology.

2. Materials and methods
Zootechnical, statistical methods and comparative analysis of the results of production experience were used in the research. For this purpose, in JSC "Plemzavod" Progress " in a herd of 120 cows to suckling calves from 1.5 months of age, in addition to mother's milk and pasture grass, they used top dressing with juicy and concentrated feed at the rate of 11-25 MJ of exchange energy (0.8-2 feed. ed) per head per day. Calves of the second uterine herd (118 heads-the control group) received no additional feed in addition to mother's milk and pasture grass (table 1). After weaning from mothers, all bulls of the experimental (1) and control (2) groups were formed in one herd, and heifers (1a, 2a) – in another and were kept in the same conditions with the same level of feeding, designed to receive at least 800 g of daily growth (table 2). To determine the growth energy, the live weight of young animals after birth, when weaning from mothers at 7 months of age, at 12, 15 and 17 months of age was taken into account.

### Table 1. Quantity and nutritional value of feed consumed by calves during the suckling period of rearing (per 1 calf).

| Feed        | Amount of feed, kg | Feed units kg | Digestible protein, kg | Exchange energy, Mj | %  |
|-------------|--------------------|---------------|------------------------|---------------------|----|
| Experienced group |                   |               |                        |                     |    |
| Milk        | 1250               | 384.5         | 40.1                   | 38.4                | 36.7| 2656.2 | 29.6 |
| Hay         | 92                 | 40.5          | 4.2                    | 9.1                 | 9.1 | 612.5  | 6.8  |
| Herbal mixture | 360               | 82.0          | 8.6                    | 9.1                 | 8.7 | 843.5  | 9.4  |
| Grain mix * | 155                | 162.1         | 16.9                   | 21.5                | 20.6| 1543.2 | 17.2 |
| Gramma      | 1450               | 290.0         | 30.2                   | 26.0                | 24.9| 3323.0 | 37.0 |
| Total       | -                  | 959.1         | 100.0                  | 104.5               | 100.0| 8978.4 | 100.0|
| Control group |                   |               |                        |                     |    |
| Milk        | 1250               | 384.5         | 57.0                   | 38.4                | 59.6| 2656.2 | 44.4 |
| Gramma      | 1450               | 290.0         | 43.0                   | 26.0                | 40.4| 3323.0 | 55.6 |
| Total       | -                  | 674.5         | 100.0                  | 64.4               | 100.0| 5979.2 | 100.0|
* Note: the composition of the grain mixture: barley pulp - 30%, wheat - 25, corn - 25, pea - 20. 1 kg of the mixture contains 1.2 feed units, 120 g of digestible protein and 952 MJ of metabolic energy.

Accounting for feed consumption and costs per 1 kg of live weight gain was determined according to the generally accepted method – by the group method, daily, and accounting for uneaten feed residues-monthly for two adjacent days. The consumption of milk of mothers was determined according to the characteristics of the breed.

3. Results and Discussion
Bulls and heifers fed during the suckling period during the experiment ate 369 and 197 kg of silage and haylage, or 4.6 and 2.6% more than their peers who did not receive top dressing during the suckling period. For the entire period of cultivation, the consumption of metabolic energy in experimental bulls was more than 4000 MJ and 50 kg of digestible protein than in peers of the control group (table 3).

The obtained data indicate that bulls and heifers of all analyzed groups have a good development of the gastrointestinal tract and are able to consume more feed. At the same time, bulls of both groups used almost 9% more dry matter and digestible protein feed than heifers. However, the consumption of digestible protein per feed unit in animals of all groups was almost the same. At the same time,
animals accustomed to eating feed during the suckling period used it better after weaning them from their mothers, which contributed to a higher energy of their growth and an increase in live weight for all periods of accounting (tables 4 and 5). The difference in favor of bulls and heifers of the experimental groups in the suckling period was 11.3 and 12.2 kg. Subsequently, the lag in growth energy in animals of the control groups increased and at the age of 17 months, experienced bulls had a live weight of 440, and heifers – 369 kg, which is 35 and 20 kg more than in peers of the control groups.

Table 2. Feed consumption from 7 to 17 months of rearing, kg.

| Group and gender | Hay | Silage | Compound feed | Straw | Haylage | Pulp | Total | Dry matter | Exchange. energy, MJ | Let's digest. protein | Feed units |
|------------------|-----|--------|---------------|-------|---------|------|-------|------------|----------------------|---------------------|------------|
| Stern            | I (bulls) | 64 | 5550 | 1270 | 1025 | 2373 | 1950 | 12232 | 4799 | 31225 | 329.5 | 3268 |
| Iа (heifers)     | 60 | 5250 | 1070 | 810  | 2280 | 1850 | 11320 | 4439 | 28883 | 304.8 | 3026 | 3026 |
| II (bulls)       | 61 | 5337 | 1270 | 978  | 2217 | 1950 | 11813 | 4712 | 30163 | 318.5 | 3157 | 3157 |
| IIа (heifers)    | 58 | 5180 | 1000 | 785  | 2153 | 1850 | 11026 | 4324 | 28134 | 296.9 | 2944 | 2944 |

Table 3. The cost of nutrients for the entire period of cultivation (per 1 bull).

| Age period, months | Nutrients | experienced | control |
|--------------------|-----------|-------------|---------|
| Newborn - 7        | Feed units | 959.1       | 674.5   |
|                    | Digestible protein, kg | 104.5 | 64.4 |
|                    | Metabolic energy, MJ | 8978.4 | 5979.2 |
| 8-18               | Feed units | 3268 | 3157 |
|                    | Digestible protein, kg | 329.5 | 318.5 |
|                    | Metabolic energy, MJ | 31225 | 30163 |
| Newborn - 18       | Feed units | 4227.1 | 3831.5 |
|                    | Digestible protein, kg | 434.0 | 382.9 |
|                    | Metabolic energy, MJ | 40203.4 | 36142.2 |

At the same time, in all age periods, there was a significant superiority in growth energy and live weight indicators between bulls and heifers. The difference in live weight increased from 24 kg at 7 months to 71 ... 56 kg at 17 months of age. In terms of growth energy, the bulls of both groups outperformed the heifers by an average of 134.... 102 grams per day. In addition, the bulls and heifers of the experimental groups met the requirements of the elite-record bonus class, and the control groups-the elite class.

Feeding calves during the suckling period had a positive effect on growth energy and absolute growth in all periods of accounting. During the suckling period, the bulls of the experimental group had an absolute increase of 7.2% and heifers by 8.3 %, and for the entire growing period – respectively 9.4 and 5.9 % higher than their peers in the control groups. A similar pattern was
observed for the average daily increase. During the entire experimental period, the bulls of the control group lagged behind the experienced ones by 70 g, and the tekes-by 38 g per head per day.

**Table 4.** Change in live weight of experimental animals, kg.

| Age, months | Const | 1 (n=58) | 1a (n=58) | 2 (n=59) | 2a (n=59) |
|-------------|-------|----------|-----------|----------|-----------|
| Newborn     | M±m   | 22±0.43  | 20±0.50   | 23±0.56  | 20±0.64   |
|             | Cy, % | 7.52     | 7.58      | 8.50     | 9.11      |
| 7           | M±m   | 203±9.3  | 179±10.0  | 191±8.1  | 167±11.7  |
|             | Cy, % | 6.44     | 5.83      | 6.03     | 5.82      |
| 12          | M±m   | 326±4.0  | 278±3.16  | 307±2.40 | 263±2.21  |
|             | Cy, % | 7.21     | 7.73      | 4.53     | 8.0       |
| 15          | M±m   | 404±5.2  | 335±2.77  | 373±3.12 | 318±2.38  |
|             | Cy, % | 5.30     | 6.18      | 7.03     | 5.80      |
| 17          | M±m   | 440±1.93 | 369±2.41  | 405±2.09 | 349±1.98  |
|             | Cy, % | 3.3      | 4.8       | 3.8      | 4.3       |

**Table 5.** Indicators of absolute (kg) and daily (g) growth.

| Age period, months | Experimental group | Control group |
|--------------------|--------------------|---------------|
|                    | Absolute Daily     | Absolute Daily |
|                    | Bulls Heifers      | Bulls Heifers |
| One day -7         | 181 159 854 750    | 168 147 792   |
| 8-12               | 123 99 804 647     | 116 96 758   |
| 13-15              | 78 57 867 633      | 66 55 733   |
| 16-17              | 36 34 600 566      | 32 31 533   |
| One day -17        | 418 349 810 676    | 382 329 740  |

The planned growth energy at the level of 800 g or more of the average daily growth was obtained only from the bulls of the experimental group. In other groups, it fluctuated at the level of 517-796 grams per head per day. The lowest growth energy in animals of all groups was in the period of 16-17 months of age, when the level of feeding decreased due to drought. During this period, the intensity of growth decreased from 60 to 9%.

It is well known that the average daily increments and dynamics of live weight of animals determine the formation of meat productivity, payback of expenses, their competitiveness and adaptability to the adopted technology. In general, during the experimental period, the animals of all groups did not have a high growth rate, but already at the age of 17 months, the bulls reached slaughter conditions with live weight indicators of more than 400 kg, with a significant superiority in favor of the animals of the experimental group. Heifers of all groups could be used in reproduction, since their live weight corresponded to 75 % of the live weight of full-aged cows. At the same time, a positive relationship between the growth energy of young animals, their live weight and the selling price with the cost recovery and profitability was established (table 6).

From the bulls of the experimental group, which have higher live weight indicators and a lower cost of 1 kg of growth than their peers of the control group, but with the same selling cost of 1 kg of live weight, 56.1% more profit was obtained. And they have 5.3% higher profitability of live weight.

4. **Conclusion**

Consequently, the intensification of calf rearing during the suckling period significantly increases the growth energy and live weight during the entire period of rearing in the conditions of stable and pasture technology and contributes to the increase of highly profitable production.
Table 6. Economic indicators of cultivation (per animal).

| Index                      | Experimental group | Control group |
|----------------------------|--------------------|---------------|
|                            | Bulls              | Heifers       | Bulls  | Heifers       |
| Live weight, 1 animal, kg  | 440                | 369           | 405    | 349           |
| Absolute gain, kg          | 418                | 349           | 382    | 329           |
| Cost of 1 kg of growth, rubles | 154.6              | 158.2         | 160.5  | 162.0         |
| Realized price of 1 kg of live weight, rubles | 174.0              | 186.0         | 174.0  | 186.0         |
| Profit received, rubles    | 8536.0             | 10258.2       | 5467.5 | 8376.0        |
| Profitability, %           | 14.72              | 23.12         | 9.37   | 19.33         |

References

[1] Amerkhanov Kh A 2018 Beef cattle breeding: a source of increasing production of high-quality beef in the Russian Federation. Meat cattle breeding - priorities and development prospects: materials of the international scientific and practical conference. Orenburg: Publishing house of FNTs BST RAN 4-7

[2] Pristupa V N 2018 History and priorities of animal husbandry in the Rostov region. Bulletin of the Orenburg State Agrarian University 6(74) 188-191

[3] Kushch E D, Polovinko L M and Kalashnikov N A 2017 Comparative assessment of Kalmyk gobies of newly created factory types. Bulletin of beef cattle breeding 1(97) 21-28

[4] Livestock of beef cattle by regions of Russia Retrieved from: www.ab-centre.ru

[5] Order of the Ministry of Health and Social Development of the Russian Federation 2010 (Moscow) 34

[6] Federal scientific and technical program for the development of agriculture for 2017 - 2025 (Moscow) 45

[7] Attack V N, Priestupa V N and Kolosov Yu A 2018 Monitoring of the breeding process and the development of a breeding program in animal husbandry (Pos Persianovsky: DonGAU) 178

[8] Attack V N, Pristupa V N, Krotova O V and Savenkov K S 2020 Meat productivity of cattle of the Kalmyk genus of various lines. Bulletin of the St Petersburg State Agrarian University 60 88-93

[9] Startseva N V 2020 Nutritional and energy value of muscle tissue of purebred and crossbred bulls. News of the Orenburg State Agrarian University 2(82) 221-224

[10] Tagirov Kh Kh and Giniatullin Sh Sh 2011 Meat productivity and meat quality of black-and-white castrates and its crosses. Bulletin of the Orenburg State Agrarian University 3(31) 169-173