

Ensuring the development of beef cattle breeding in the Ust-Labinsk region of the Krasnodar Territory through meadow grass stands

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Abstract. The purpose of the research was to study the efficiency of using land for the development of beef cattle and sheep breeding in the regions of the Krasnodar Territory. The species eaten in the studied areas make up 75.0-93.8%. In the Ust-Labinsk district of the Krasnodar Territory, all studied areas meet the yield requirements, except No. 4, No. 5 and No. 6. Natural pastures can be effectively used with calculated indicators taking into account the grass yield in 3 cuttings of up to 2 hectares per 1 conventional head of cattle. In the studied area, one conventional head in the summer period (lasting 200 days) requires 2144 EFU, in the winter period (lasting 165 days) - 1602.15 EFU, in total for the year - 3746.15 EFU. To ensure the highest profitability from meat animals in the highly rugged terrain of the studied natural meadows, it is recommended to give preference to Hereford, Aberdeen Angus or Kazakh white-headed breeds of cattle.

1 Introduction

In animals, thanks to exercise, high-vitamin green food, sunlight, clean, ammonia-free air, productivity increases and, most importantly, the reproductive functions of animals improve, thereby increasing the yield of offspring to 95 - 97%.

For normal life, herbivores require not only abundance, but also a variety of food. The participation of small-stemmed forbs (fall dandelion, margaret herb, scorzonera, dandelion, salsify, lady's mantle, bluebells) in the formation of herbage yield is insignificant and their feed value is small, but it has a direct impact on the quality and quantity of livestock products.

Forming a powerful fibrous root system, grasses reliably protect the soil from water and wind erosion on slopes, enriching it with organic matter. Their perennial elastic turf

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withstands significant pressure from animal hooves, preventing excessive soil compaction [1-4].

There is a system of using grass stands that provides animals with feed not only in the summer, but also in the predominant part of the winter period. It includes both grazing and early harvesting of high-quality hay. It is assumed that in the spring and early summer, grasses grow so intensively that they form an excess of green feed of such a size that animals are unable to digest. If this part of the grass stand is not used in a timely manner, the feed on it becomes coarse, loses its nutritional value and, as a result, its value decreases to the level of winter straw. According to the modern fundamental scheme of effective use of grass stand, only 2/5 of the total meadow area is allocated for grazing in the first cycle (from 5.05 to 12.06). On this part, using a portable electric fence, a portion of grass stand with an area of 25 to 50 m² is allocated per day per animal. The portion size depends on the availability of green mass - the higher the yield, the smaller the portion, but with the condition that the cow should be able to eat from 45 to 60 kg of grass during 11 hours of being on the pasture. The remaining 3/5 of the area is intended for haymaking [5-7].

The areas for mowing should change places with the areas for grazing annually. The approximate pasture load for each grazing cycle can be determined empirically.

For example, having mowed grass on 1 m² (a square with sides of 1 × 1 m) of a typical grass stand, we establish that its weight is 0.4 kilograms, which corresponds to 40 centners per 1 ha. One animal weighing 500 kg requires 65 kg of grass per day, and for 100 cows, respectively, 65 centners. Dividing the herd's requirement (65 centners) by the actual feed supply (40 centners), we get that 1.6 hectares of pasture must be allocated for 100 cows to graze during one day [7-10].

With little precipitation and high summer temperatures, which are often observed in the Krasnodar region, there is a decrease in soil moisture, which leads to slower plant growth and a decrease in their yield.

To ensure feeding, walking, and increasing productivity, grazing of farm animals is necessary. To identify territories suitable for this, we conducted a survey of natural forage lands in the Krasnodar Territory.

The purpose of the work was to study the efficiency of using land for the development of beef cattle and sheep breeding in the regions of the Krasnodar Territory.

Comparison of meteorological observations with the dry mass yield of grasses reflects a direct dependence of the productivity of natural meadows on the amount of precipitation during the growing season.

2 Material and methods

In 2022, in the Ust-Labinsky district of the Krasnodar Territory, an analysis of climatic conditions was carried out as the main factor in the productivity of natural hayfields and pastures (Table 1).

Table 1. Main climatic indicators of the Ust-Labinsk region.

Parameters	April	May	June	July	August	September	During the vegetation period
Air temperature, °C	15.1	18.2	21.2	23.1	22.7	25.0	20.9
Precipitation amount, mm	6.0	66.0	124.0	30.0	11.0	30.0	267.0

The reserves of productive moisture in the meter layer of soil at the beginning of the active growing season in the studied area were good - 170 – 200 mm.

According to the group composition of the grass stand, which means the participation in it (in order of decreasing number of plants) of cereal grasses, legume grasses and forbs, most of the plots can be considered legume-forb-cereal, although some are forb-cereal and, even less common, cereal-forb-legume.

The group composition of the grass stand mainly in most of the surveyed plots consisted of cereal grasses - 70-80%, 20-30% were forbs.

This ratio, as the grass stand develops during the growing season, due to a change in the dominance of some groups, can acquire other characteristics and change in the direction of an increase or decrease in individual groups.

3 Results and discussions

In the Ust-Labinsk region, 10 sites were surveyed.

Plot 1. Bratsky farm, Ust-Labinsk district. Haymaking, pasture. Field sow thistle – 3, meadow fescue – 4, creeping wheatgrass – 6, horned sweet grass – 2, awnless brome – 2. The species eaten make up 82.3%.

Plot 2. Saratovsky farm, Ust-Labinsk district. Haymaking, pasture. Field bindweed – 1, meadow fescue – 7, creeping wheatgrass – 4, awnless brome – 2. The species eaten make up 92.8%.

Plot 3. Kalininsky farm, Ust-Labinsk district. Haymaking, pasture. Common thistle – 1, meadow fescue – 7, creeping wheatgrass – 3, meadow clover – 1, awnless brome – 4. The species eaten make up 93.8%.

Plot 4. Krasny farm, Ust-Labinsk district. Haymaking, pasture. Bird's-foot trefoil - 5, meadow fescue - 3, creeping wheatgrass - 3, large plantain - 2, awnless brome - 2. The species eaten make up 86.6%.

Plot 5. Krasny farm, Ust-Labinsk district. Haymaking, pasture. Creeping wheatgrass – 7, small-petalled canadian grass – 1, bird's-foot trefoil – 3, meadow clover – 2, awnless brome – 3. The species eaten make up 93.8%.

Site 6. Krasny farm, Ust-Labinsk district. Haymaking, pasture. Common yarrow – 1, meadow fescue – 2, creeping wheatgrass – 8, awnless brome – 3. The species eaten make up 92.8%.

Plot 7. Semenov farm, Ust-Labinsk district. Haymaking, pasture. Horse sorrel – 3, tall fescue – 2, creeping wheatgrass – 5, awnless brome – 2. The species eaten make up 75.0%.

Section 8. Ladozhskaya village, Ust-Labinsk district. Haymaking, pasture. Common agrimony – 2, meadow fescue – 7, creeping wheatgrass – 3, awnless brome – 2. The species eaten make up 85.7%.

Site 9. Bolgov farmstead, Ust-Labinsk district. Haymaking, pasture. Meadow bluegrass – 7, creeping wheatgrass – 3, cocksfoot – 2, bird's-foot trefoil – 2, lanceolate plantain – 2, awnless brome – 2. The species eaten make up 88.8%.

Plot 10. Bratsky farm, Ust-Labinsk district. Haymaking, pasture. Horned brome grass – 4, awnless brome – 3, creeping wheatgrass – 7, common caraway – 1. The species eaten make up 93.3%.

Cereal grasses of the highest forage value.

Meadow fescue (*Festuca pratensis*) is one of the most valuable meadow grasses, suitable for both pasture and hay use. Animals eat green mass and hay very well. It grows back well after mowing, is resistant to grazing. It survives in meadows for 6-8 years or more. In pastures it can withstand up to 4 grazings, in hayfields it gives 2 cuts. In the tillering phase (pasture maturity) it contains 13-16% protein per dry matter, at the beginning of flowering - 9-11%, at full flowering - 6-8%, fiber 24-33%. If we take into account that the optimal protein content per 1 feed unit for good animal productivity in

pasture feed should be at least 115 g of protein, then fescue has insufficient protein, as it is only 83.65 g.

Meadow bluegrass (*Poa pratensis*). Typically pasture cereal. Perennial rhizome plant of the winter type of development. Withstands a large number of grazing and quickly grows throughout the grazing period. It suffers little from trampling, thanks to the underground rhizomes it actively grows, creating a dense grass stand. The green mass is highly nutritious, rich in minerals and vitamins.

Cereal grasses of good forage value.

Cocktail grass (*Dáctylis glomeráta*) is often found in the studied natural meadow grasslands. It is a perennial loose-bunch grass up to 150 cm high. It is a winter-type plant that grows back well and early after overwintering, haymaking and grazing. It has good nutritional value. 100 kg of green mass in the tillering phase contains 20.3 feed units and 4.2 kg of digestible protein. The carotene content per dry mass in 1 kg of grass ranges from 389 mg/kg in the booting phase to 242 mg/kg in the flowering phase.

The most valuable legumes in natural grass stands are white clover (creeping), meadow clover (red), alfalfa, yellow alfalfa (sickle-shaped), vetch-mouse pea.

In natural grass stands, their share fluctuates at the level of 25%. Only after haymaking or the first grazing, their share can reach about 40% due to reduced shading.

Legumes are very well eaten by animals both in the green state and as hay, they contain significantly more protein, fat and less fiber than cereal grasses. The optimal time for haymaking of legumes falls on the phase of their full flowering, and grazing of cattle on pasture from the end of tillering to the end of budding.

Red clover (*Trifolium pratense*) is a perennial plant with straight or ascending stems on natural meadows 40 - 100 cm high. It grows back well both after grazing and mowing, but when grazing, due to soil compaction, it falls out heavily in the 3rd year. When eating large amounts of green mass, especially wet from rain or heavy dew, it usually causes the disease tympania in ruminants. Per 1 feed unit there are 100-175 g of digestible protein. The amino acid content (in % of crude protein) is: lysine - 3.93; histidine - 1.8; arginine - 4.7; threonine - 2.33; valine - 2.82; methionine - 1.04; isoleucine - 7.63; phenylalanine - 3.41; tryptophan - 0.88.

White clover (creeping) (*Trifolium repens*) is a perennial, light-loving plant, therefore it is strongly suppressed in hayfields. It tolerates intensive grazing well. The protein content in the feed is 34.6%, 31.4% fiber, 3.4% fat, 9.3% ash, 41.8% NEV.

Similar clover (*Trifolium ambiguum*) is one of the most common native legumes of the Caucasus region. It is eaten by all types of farm animals. It tolerates grazing well. In the flowering phase it contains 18.1–22.5%, and in the budding phase 13.7% protein and 14.3% fiber on an absolutely dry basis, in which lysine is 4.31%, histidine - 2.21%, arginine - 3.78%, threonine - 4.15%; valine - 4.39%, methionine - 1.05%, isoleucine - 10.5%, phenylalanine - 4.24%, tryptophan - 0.85%. The usual yield of green mass is 220 c/ha or 40 c/ha of hay. In absolutely dry matter the content of fat is 1.78, ash - 11.02, NEV - 12.35; Ca - 0.27; P - 0.67%. Yellow sickle-shaped alfalfa (*Medicago falcata*) is a perennial plant with straight, ascending and prostrate stems. In chemical composition it is close to alfalfa. Many geographic populations contain in the aboveground mass (on dry matter) 15.2 - 19.1% protein, 30 - 38% fiber, 9.8 - 11.9% ash, 2.2 - 2.4% fat and 34 - 36% NEV with the digestibility coefficient of protein - 77, protein - 70, fat - 29, fiber - 54, NEV - 82.

Alfalfa - *Medicago sativa*. A perennial, highly bushy plant with straight, branched stems - 80-100 cm or more. The crop is distinguished by its high potential yield, quickly grows back in the spring and after mowing. It has a unique mowing rate, in Kuban - three to four. The hay contains (in % of absolutely dry matter): 18% protein, 14.2% protein, 2.7% fat, 30.2% fiber, 39.4% nitrogen-free extractive substances.

Horned rhizome (*Lótus corniculátus*) - A valuable forage plant. It tolerates both mowing and grazing well. In the flowering phase, the green mass acquires a bitter taste due to the presence of cyanide compounds and is therefore not eaten, although it is not poisonous. It does not cause tympany.

It remains in the grass stand for 8-12 years. Hay is considered to be vitamin-rich and dietary for all animals.

Vetch (mouse pea) (*Vícia crácca*) - On pastures, it is well eaten by cattle, sheep, horses before the beginning of fruit setting. After setting, the stems become coarse and the palatability of pure grass stands is only satisfactory, but in grass mixtures with cereals and other legumes, palatability is good, especially by sheep. Not resistant to grazing, but it grows back well after mowing. It is considered one of the best forage plants in hayfields. In the flowering - fruiting phase.

Many representatives of various herbs are readily eaten by animals during the growing season in green form or in the form of hay mixed with cereals and legumes. Juicy leaves and stems contain 65–80% water, many vitamins, protein, minerals: calcium, phosphorus, potassium, magnesium and others.

Plants in this group have less fiber than cereal grasses, and they contain less hemicellulose and more cellulose, which is more easily broken down in the stomach. The effect of plants of this group on the animal's body is specific. They stimulate appetite, increase milk synthesis and its fat content, and increase the activity of certain organs and glands.

Bellflower rapunzel (*Campanula rapunculoides* L.) is a perennial plant with creeping underground shoots. It is very well eaten by animals in a green state and in hay. Contains up to 20% protein. Promotes an increase in milk yield and fat content. Content (% of absolute dry matter) – protein – 11.22, protein – 8.42, fat – 2.81, fiber – 27.63, NEV – 49.63, ash – 8.71.

Common caraway (*Carum carvi* L.). Biennial plant. Tolerates moderate grazing and haymaking well. Grows back quickly. Nutritious, dietary forage crop. Eats well on pastures before the fruiting phase by cattle, sheep, horses, rabbits. Increases milk yield. Content (% of absolute dry matter): protein - 21.88, protein - 14.05, fat - 2.61, fiber - 24.94, NEV - 37.44, P - 0.74, K - 4.37, Ca - 1.03, ash - 8.71.

Meadow salsify - (*Tragopogon pratensis* L.) - a biennial, well-leafed plant up to 80 cm high. After grazing, it grows back satisfactorily. Animals eat the green mass together with the inflorescences well. An excellent taste and lactogenic plant. Contents during the flowering phase (% of absolute dry matter): fiber - 30.44, NEV - 36.92, ash - 5.35, P - 0.24, K - 3.2, Ca - 0.91.

Dandelion (*Taraxacum officinale* Web. ex Wigg.) is a perennial plant 10 - 40 cm high. In spring, animals readily eat it. Sheep readily eat the green mass, despite the presence of bitter substances. Cattle eat it in small quantities. The leaves are the best source of iron, calcium and phosphorus. Contents (% of absolute dry matter): protein - 21.42, protein - 18.93, fat - 4.43, fiber - 19.87, NEV - 41.97%.

Compass lettuce or wild lettuce (*Lactuca scarioca* L. *serriola* Torner.) is a biennial plant up to 120 cm tall. The green mass and silage are readily eaten by cattle and sheep. When feeding green lettuce to dairy cows, milk yield increases sharply, and when fattening - live weight gain. The green mass is well ensiled. Before flowering, the green mass contains (% of absolute dry matter) protein - 19.09, protein - 14.41, fat - 4.30, fiber - 25.37, NFE - 37.11, ash - 14.13. During the flowering period, the nutritional value of lettuce decreases and is: protein - 13.9, protein - 9.31, fat - 4.40, fiber - 31.23, NEV - 39.13, ash - 11.34. The digestibility coefficient of organic matter is 70.9, protein - 72.8%, protein - 74.9, fat - 52.3, fiber - 51, NEV - 84%.

Wild carrot (*Daucus carota* L.) is an annual or biennial plant up to 120 cm tall. Before flowering, it is eaten well by all animals in pastures, during flowering, sheep eat it willingly, cattle - satisfactorily, in hay - well. Before flowering, the green mass contains (% of absolute dry matter): protein - 26.98; protein - 13.49; fat - 1.20; fiber - 30.38; NEV - 26.67; P - 0.49; K - 5.18; Ca - 1.05; ash - 14.67.

Crimean scorzonera - scorzonera (*Scorzonera taurica* Bieb.) is a perennial pasture plant 40 - 90 cm high. It is well eaten by cows and sheep. When added to feed, it helps to increase milk yield. 1 kg of green mass in the full flowering phase contains 0.41 feed units, 4.52 MJ of exchange energy, 8.86% protein, including 72 g digestible, 1.52% crude fat, 7.45% fiber, 6.13% ash, 21.55% NFE, in addition, it contains 7.09 calcium, 1.49% digestible phosphorus, 3.38 g magnesium, 21.27 g potassium and 0.08 g sodium. Of the microelements found (mg / kg): iron - 373.0; zinc - 16.0; manganese - 28.6; copper - 3.0 and cobalt - 0.05.

Fireweed (*Chamaenerion*) grows in three varieties in the Northwest Caucasus: narrow-leaved, narrow and Caucasian, but only the narrow-leaved variety is valued as a forage plant. It is a perennial long-rhizome root-suckering herbaceous plant up to 250 cm high. It grows back well after mowing, but is unstable to trampling. In its young state, it is eaten satisfactorily only by sheep, and the tops and young shoots are occasionally used by cattle. The green mass contains (% of absolute dry content) protein - 24.57, protein - 23.48, fat - 2.37, fiber - 16.09, NEV - 46.54, vitamin C - 338 mg%, as well as trace elements - iron, nickel, titanium, molybdenum and boron. It contains pectins, flavonoids, and phenylcarboxylic acids [3, 8].

Pasture maintenance of herbivorous animals reduces feeding costs, reducing them by at least 2 times compared to stall maintenance, that is, bringing them to 30%.

The yield of the surveyed natural areas of hayfields and pastures in the Ust-Labinsk region is presented in Table 2.

Table 2. Productivity for three cuttings, c/ha.

Plot number	Green material				Air-dry weight				Absolutely dry mass				Hay yield %		
	I	II	III	sum	I	II	III	sum	I	II	III	sum	I	II	III
1	61.3	58.4	56.4	176.1	16.5	17.1	16.5	50.1	14.3	14.7	14.8	43.8	26.9	29.3	29.3
2	60.8	56.8	52.6	170.2	18.4	15.8	14.6	48.8	15.9	13.6	13.4	42.9	30.2	27.8	27.8
3	64.2	55.2	54.2	173.6	17.8	16.7	16.4	50.9	15.4	14.3	14.7	44.4	27.7	30.3	30.3
4	20.2	16.5	14.5	51.2	5.3	5.1	4.5	14.9	4.6	4.3	4.5	13.4	26.2	30.9	31.0
5	21.3	18.6	16.7	56.6	5.6	5.4	4.9	15.9	4.8	4.6	4.4	13.8	26.2	29.0	29.3
6	22.8	19.4	17.4	59.6	6.5	5.5	4.9	16.9	5.6	4.7	4.4	14.7	28.5	28.4	28.2
7	56.7	52.4	48.2	157.3	15.7	14.1	13.0	42.8	13.6	12.1	11.7	37.4	27.6	26.9	27.0
8	66.0	60.3	55.3	181.6	17.8	15.8	14.5	48.1	15.4	13.6	13.5	42.5	26.9	26.2	26.2
9	80.8	76.2	72.0	229.0	21.2	21.1	20.2	62.5	18.4	18.1	18.8	55.3	26.2	27.7	28.1
10	36.0	33.1	27.2	96.3	10.3	9.7	8.4	28.4	8.9	8.3	7.6	24.8	28.6	29.3	30.9

The indicators of collection of nutrients from the grass stand in the surveyed areas of the Ust-Labinsk region are presented in Table 3.

Table 3. Collection of nutrients, c/ha.

Plot number	Absolutely dry mass	Indicators							
		total energy nutritional value, FU	crude protein	crude fiber	crude fat	ash	Ca	P	carotene. kg/ha
1	43.8	1.94	4.3	17.14	1.96	4.80	0.37	0.080	0.28
2	42.9	2.34	4.0	16.25	2.15	4.90	0.26	0.093	0.19
3	44.4	2.14	4.1	17.59	2.00	4.67	0.39	0.088	0.15
4	13.4	1.74	1.3	5.15	0.67	1.53	0.12	0.026	0.05
5	13.8	2.34	1.3	5.32	0.70	1.45	0.12	0.027	0.09
6	14.7	1.74	1.4	5.65	0.74	1.65	0.10	0.032	0.05
7	37.4	2.14	3.6	13.82	1.70	3.93	0.33	0.074	0.24
8	42.5	1.74	4.1	16.34	2.13	4.84	0.26	0.083	0.27
9	55.3	2.34	5.4	21.38	2.50	5.81	0.48	0.109	0.35
10	24.8	1.74	2.4	9.53	1.24	2.79	0.17	0.054	0.11

The number of hectares in the surveyed areas of meadows per one conventional head was calculated.

Knowing the need for green mass and the number of cows and sheep, the characteristics and productivity of pastures, they draw up a plan for the use of all pastures available on farms.

The required area of natural pastures was calculated based on their productivity (Table 4).

Table 4. Number of hectares per conventional head. Ust-Labinsk district.

Plot number	ha/head
1	0.95
2	0.97
3	0.94
4	3.12
5	3.03
6	2.84
7	1.12
8	0.98
9	0.76
10	1.68

In our opinion, natural pastures can be effectively used with calculated indicators taking into account the grass yield in 3 cuttings of up to 2 hectares per 1 conventional head of cattle. Consequently, in the Ust-Labinsk region, all areas except No. 4, No. 5 and No. 6 meet the yield requirements.

In the area under study, one conventional head in the summer period (lasting 200 days) requires 2144 EFU, in the winter period (lasting 165 days) - 1602.15 EFU, in total for the year 3746.15 EFU.

The profitability level of raising beef cattle reaches 27.5%.

To ensure the highest profitability from meat animals in the highly rugged terrain of the studied natural meadows, it is recommended to give preference to Hereford, Aberdeen Angus or Kazakh white-headed cattle breeds.

4 Conclusions

The species eaten in the studied areas make up 75.0-93.8%.

In the Ust-Labinsky district of the Krasnodar Territory, all studied areas meet the yield requirements, except No. 4, No. 5 and No. 6.

Natural pastures can be effectively used with calculated indicators taking into account the grass yield in 3 cuttings of up to 2 hectares per 1 conventional head of cattle.

In the study area, one conventional head in the summer period requires 2144 EFU, in the winter period - 1602.15 EFU, in total for the year 3746.15 EFU.

To ensure the highest profitability from meat animals in the highly rugged terrain of the studied natural meadows, it is recommended to give preference to Hereford, Aberdeen Angus or Kazakh white-headed cattle breeds.

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