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Prospects for Using Unmanned Aerial Vehicles to Improve the Efficiency of Grazing Livestock.

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ABSTRACT

The article presents results of an analytical review of the current main trends in the production of beef in the Stavropol region and developed proposals for the use of unmanned aerial vehicles to improve the profitability of raising livestock for meat. It is recommended to form an integral organizational and information segment with the participation of a center for aerial photography, production and primary processing of livestock and sale of finished products.

Keywords: unmanned aerial vehicles, pasture technology for beef production, livestock production for meat

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INTRODUCTION

Increasing the production of beef while reducing labor and energy costs is an important national economic task for the livestock sector [1, 2]. The complex terrain and uniqueness of the geographic location of the region determined the presence of four natural climatic zones: semi-desert (extremely arid), steppe (arid), forest-steppe (unstable hydration) and foothills (sufficient moisture). The reduction of more than twofold the level of beef production in the region over the past 20-25 years demonstrates the acute nature of the problem of providing the population with high-quality animal protein and necessitates the search for new technological approaches in the development of the industry.

One of the reserves to improve the efficiency of beef production is the acceleration of the development of pasture cattle breeding with the use of unmanned aerial vehicles [3].

The effectiveness of beef production in the Stavropol Territory was shown on the example of the development of grazing livestock in the peasant farm of Kolesnikov, where a highly productive herd of beef cattle was created with the energy of growth of young animals for fattening at the level of 1300-1500 grams of daily average weight gain [4].

The use of unmanned aerial vehicles makes it possible to obtain information on the dynamics of vegetation of forage grasses on different pastures, to identify the optimal stage for the use of each site. The most effective is the use of a small, medium-range unmanned aerial vehicle (UAV) with takeoff weight from 5 to 50 kg, range from 5 to 75 km.

MATERIALS AND METHODS

The purpose of our research was to develop technological solutions for the effective development of intensive pasture livestock production by growing livestock for meat in the steppe zone to produce fat young animals with a live weight of 430-450 kg at 12-14 months of age.

Technique of conducting scientific and economic experiments. Six groups (three experimental and three control) of clinically and physiologically healthy gobies of Ukrainskaya meat breed, light Akvitanskaya and gray Ukrainskaya breeds at the age of 9 months with a live weight corresponding to a bonito standard of 4 heads per group were selected for the study.

Cultivation of livestock of the experimental groups was carried out according to the author's low-cost technology in the agrofirma "Kotovka" on the Dnieper area of Ukraine: on a natural pasture module, which was a fenced pasture area with special technological equipment for feeding fodder - feed grids and self-feeders [5, 6], under load 1 head of the young at 2 hectares. Animals had free access to all kinds of forages: pasture, coarse and concentrated. Cattle had free access to water, the water flowed from the natural pond and from the trough measuring 0.5 × 5 m. Mineral fertilizing (tricalcium phosphate and salt) was fed from the self-feeders with free access to them.

The maintenance of the cattle of the control group took place according to the traditional stall-walking technology in the state breeding plant "Polivanovka" located in the same region. Feeding bulls occurred by mechanized distribution of silage and potato fodder. Distribution of hay, straw and concentrated feed and mineral fertilizing took place manually. The water flowed from a trough measuring 0.5 × 5.0 m.

The feeding level of the young animals of the experimental groups was calculated to obtain an average daily increase in live weight at the level of 800 g.

Accounting for feed intake in control groups of animals was carried out by carrying out control feeding [7]. Consumption of fodder for grazing was estimated by grazing animals on control sites [8]. Feeding nutrition was determined by carrying out a zoochemical analysis using standard techniques [9]. Meat production of young animals was studied by carrying out a control slaughter by conventional methods [10].

RESULTS AND DISCUSSION

Experimental and control groups (4 heads in groups) of 9-month-old bull-calves of various breeds with live weight, respectively, were selected for the study, Ukrainskaya meat breed: 319 ± 6.20 kg (Group I) and 321 ± 6.63 kg (IV Group); light Akvitanskaya: 307 ± 7.11 kg (group II) and 308 ± 8.37 kg (group V); gray Ukrainskaya breed: 247 ± 2.38 kg (group III) and 248 ± 2.47 kg (group VI) (Table 1).

Table 1: Indicators of growing of gobies of experimental groups ($\bar{X} \pm Sx$)

Groups of animals	Breed	Live weight (kg), at the age of (month)		The average daily gain of live weight, g
		9	14	
I experienced	Ukrainskaya meat breed	318,5 ± 8,37	453,3 ± 5,78	1050,8 ± 36,08
II experienced	Light Akvitanskaya	307,0 ± 7,11	431,8 ± 4,61	974,5 ± 43,48
III experienced	Gray Ukrainskaya	247,0 ± 2,38	370,0 ± 5,61	960,8 ± 44,3
IV control	Ukrainskaya meat breed	320,8 ± 6,63	411,0 ± 3,49	705,3 ± 39,33
+/- to I group	-	+ 2,3	- 42,3**	- 345,5**
V control	Light Akvitanskaya	308,3 ± 8,37	397,0 ± 7,01	693,3 ± 30,89
+/- before II group	-	+ 1,3	- 34,8**	- 281,2**
VI control	Gray Ukrainskaya	248,0 ± 2,16	333,0 ± 4,42	664,3 ± 37,02
+/- before III group	-	+ 1,0	- 37,0**	- 296,5**

Note ** - reliability of differences P < 0,05

Average daily feed intake by gobies of experimental groups at different age periods on the natural pasture module was: pasture - 13-35 kg, coarse - 0.5-1.0 kg, concentrated - 2.5-3.0 kg, which is 5, 5-10.5 fodder units. The diet of feeding the cattle of control groups included silage - 16-22 kg, hay - 1.0-2.0 kg, straw - 3 kg, mixed feed - 1.5-3 kg, average daily nutritional value of the diet was 6.5-8.5 fodder units.

Pasture period of keeping bulls for low-cost technology was 128 days. At 14 months of age, the live weight of the bulls of Groups I, II, and III was 42.0 kg, 35.0 kg and 37.0 kg more than their corresponding control analogs (P < 0.05). The average daily live weight gain in the experimental groups during the reference period was 40.7 - 49.1% higher compared to the control peers of the IV, V and VI groups with the traditional technology of their cultivation (P < 0.05).

Bulls of experimental groups of specialized meat breeds, when cultivated according to the developed low-cost technology by the age of 12-14 months, have reached high quality slaughter conditions with effective feed utilization, which allows us to recommend using the results obtained to increase the profitability of beef production in the Stavropol region under similar climatic conditions.

Carrying out of marketing researches has shown that in Russia unmanned aerial vehicles of 7 kinds are used, starting from micro and mini UAV of short range of 25-40 km, with take-off weight up to 5 kg, and heavy UAV of long range up to 1500 km, with take-off with a mass of 1500 kg. The most effective for obtaining information on the dynamics of vegetation of forage grasses on different pastures and identifying the optimal stage for the use of each site will be the use of UAV first 3 classes: micro and mini; light small and medium range of action from 10 to 250 km, with a useful mass of 5-100 kg.

Using UAV will allow: remote assessment of pasture capacity and monitoring of its changes; remote monitoring of water content and pasture fertility; to receive in real time information on the dynamics of vegetation of forage grasses on given pastures; Identify the optimal stage of pasture use for each site; ensure the most effective use of pastures, timely identification of pasture conditions, search for new pastures; Ensure a gentle mode of bleeding grass; to develop regimes for accelerated restoration of pasture pastures; remotely

offer recommendations for accelerated restoration of pasture pastures. The collected information will be accumulated on the server, after analyzing the aggregate of analytical data, the results will be displayed on the monitors.

CONCLUSION

- Growing of gobies of Ukrainian meat, light aquatic and gray Ukrainian breeds on the developed low-cost technology promoted increase of average daily increments of their live weight in comparison with analogues of control groups by 282-346 g ($p < 0,05$), which allowed obtaining 14-month-old animals specialized meat breeds with live weight of 432-453 kg.
- For planting with the use of a pasture module, a 9-month-old young animals with a live mass not lower than the class I class of the corresponding breed should be selected.
- For the monitoring of pasture conditions, the use of unmanned aerial vehicles (UAV) of short, medium and medium range with take-off mass from 5 to 50 kg, range of action from 5 to 75 km is most effective.

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