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Machines for strengthening the fodder of arid livestock

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Abstract. The article is devoted to technologies and machines that solve the problem of strengthening the fodder base of arid animal husbandry. It outlines an energy-saving, environmental technology to combat degradation and improve desert pastures. The issues of seed production, hay harvesting from natural pastures and control of pasture weeds were touched upon. Information on special machines for the implementation of technologies is given: combating degradation and improving pastures; the production of seeds for pasture fodder plants; harvesting hay from natural pastures.

1. Introduction

Livestock is a priority sector of the national economy, aimed at solving the food program and providing light industry with raw materials.

There are great opportunities in the production of livestock products in desert pasture (arid) animal husbandry. So, 52% or more than 20 million hectares of the territory of the Republic of Uzbekistan is allocated to arid animal husbandry. It contains sheep breeding, including karakul breeding, camel breeding, cattle, horse breeding, which are kept on grazing pastures almost all year round and represent a solid potential for solving the problems of providing the population with livestock products. In addition, karakul leather was an export product that significantly predetermined the economic efficiency of the industry [1–4].

The basis for the further development of the pasture livestock industry is a solid forage base. In the conditions of keeping animals on pasture grazing, the concept of a solid forage base is, first of all, the productivity (yield of forage plants) of pastures.

Unfortunately, the state of the pastures today does not meet the requirements of the industry. Almost 40 percent of the republic's arid pastures are degraded to varying degrees [5]. Their productivity is far from meeting the needs of the existing livestock. Valuable species of forage plants are disappearing. The ecological well-being of pasture areas has been violated [6–11].

The area of degraded pastures in need of improvement in the republic is about 8.0 million hectares and continues to grow.

Degradation of arid pastures is a global problem, 10 reasons for which:

- global climate change;
- overloading of pastures by grazing by animals;



- cutting down vegetation for animal feed in winter and its safety reserves for lean years, as well as for fuel;

- almost no work to improve pastures;
- various technogenic and anthropogenic factors (development of minerals, fencing of pasture areas by digging trenches, laying roads, overgrowing with pasture weeds).

Thus, the problem of stable development of arid animal husbandry requires large-scale work to combat degradation and increase the fodder productivity of pastures [3].

The voiced problem is inextricably linked with the production of a substantial volume of seeds of pasture fodder plants. So, for example, if the program is adopted: - **“Improve degraded pastures in 10 years”**, then 800 thousand hectares of pastures will have to be improved annually. At a seeding rate of 3 kg / ha, 2.400 tons of seeds will be required annually.

With a seed germination rate of 50%, the annual need will already be about 5 thousand tons. How Seeds of desert-pasture plants growing in extreme conditions (lack of soil moisture, poor soil humus, drought, dry winds) have low germination. We see that it is necessary to produce a solid volume of seeds.

Unfortunately, the issue of seed production has not yet been established.

Sowing is carried out by handicraft methods, for example, manually scattering seeds from a cart.

Seed collection is also done manually. This is unproductive, laborious and far from meeting today's needs for grazing plant seeds.

Thus, the existing reality of seed production does not meet modern requirements for strengthening the fodder base of desert pasture animal husbandry. Therefore, it is no coincidence that the Bukhara research and production center for seed production of steppe pasture fodder plants was organized by the presidential decree of March 14, 2018, with the allocation of pasture land for seed production.

As we can see, the problem of strengthening the fodder base of arid animal husbandry, covering the issues of protecting arid pastures from degradation and increasing their productivity, also depends on the well-established production of seeds of pasture plants.

The important part of the problem of strengthening the fodder base of arid animal husbandry is the preparation of hay for the winter period and its insurance carry-over stocks in case of dry years, when the fate of the livestock may depend on its availability. Hay is harvested from natural pastures. Due to the low yield of 2.0 - 2.5 c / ha (200-250 g / m²), it is not possible to use traditional hay harvesting machines here. Therefore, hay harvesting by the method of catmen cutting of pasture plants is often practiced. It is unproductive and harmful in the environment.

In recent years, the problem of overgrowing of pastures with weeds, for example, Isfen (local name - isriq), has progressed. Being abundantly inseminated, it covers the pasture with continuous thickets, representing one of the indicators of pasture degradation.

Thus, the problem of strengthening the fodder base of arid animal husbandry, taking into account the vast territories, requires the development of mechanized technologies and technical means for:

- combating the degradation of pastures, increasing their productivity, and seasonality of use;
- production of seeds of forage plants;
- harvesting hay from natural pastures;
- control of pasture weeds.

Taking into account the large volume of work, the technologies and the machines that implement them must be high-performance, environmental, energy and resource-saving.

The solution to these problems has been dealt with before. So, Abdullaev M. [12], Leshko V.N. [13] were engaged in the issues of mechanization of collecting seeds of pasture fodder plants, issues of sowing seeds of pasture plants Musaev T.M. [14], issues of cleaning seeds - Urdiev Sh. [15], Turabaev A.T. [16], Kuibakov B.B. [17].

In the direction of solving the problems of strengthening the fodder base of desert-pasture animal husbandry, the head design bureau of BMKB-Agromash JSC in collaboration with, TIAME and JV Agrihim developed improved mechanized technologies and a complex of machines in the noted areas of strengthening the fodder base of arid animal husbandry.

2. Materials and methods

When developing a technology for combating degradation and improving pastures, the technology of creating saxaul strips was taken as a basis, taking into account a number of advantages:

- They reduce wind speed by 1.5–2.0 times, trap snow, and protect the soil from drying out.
- the productivity of the pasture on the leeward side of the strip at a distance of up to 100 meters increases by 25% due to the created microclimate;
- in the strip itself, the yield of forage increases by 2-3 times;
- on days of strong winds, high heat, and bad weather in winter.

It serves as a shelter for karakul sheep [18].

From the point of view of mechanization, the method is attractive because of its low energy consumption.

The machines were developed according to the standard methodology. Based on the analysis of a specific technological process, a preliminary layout diagram of the machine was developed. Taking into account the elements of the layout scheme, the initial requirements for the car were drawn up. After the approval procedure, the terms of reference for the car were developed. Further, design documentation and working drawings were developed, according to which prototypes of technical equipment were manufactured. After the machine was manufactured, it underwent factory tests and, with the elimination of comments, was transferred to production tests.

3. Results and Discussion

To implement the technology for combating degradation and improving pastures, the head design organization of JSC “BMKB - Agromash” has developed a combined unit (figure 1), which performs in one pass the entire complex of works on processing narrow soil strips, sowing and planting seeds of pasture plants. The machine uses an original method for planting seeds of desert-pasture plants requiring shallow planting. The design of the machine is protected by two patents. The machine can be used to combat pasture degradation, improve low-yielding pastures, create all-season pastures and establish seed crops [19].



Figure 1. General view of the combined unit.

The principle of cultivation and sowing of narrow soil strips adopted in the machine provides it with environmental and energy-saving qualities.

Forest belts are laid from several oncoming runs of the unit. The outer sections of the machine sow a mixture of shrubs and grasses, and the middle section - saxaul mixed with shrubs and grasses. The width of the cultivated and sown strips is 25 sm. The width of the main row spacing is 70 sm. The width of the butt row spacing, taking into account the crown of the saxaul, is selected within 1.5 meters. The total width of the forest belt is chosen at 25.0 - 30.0 meters. The distance between forest

belts is 100 meters or more. Such a scheme ensures high productivity, reduced energy consumption and environmental protection qualities of the technology.

To mechanize the process of collecting seeds, a seed heap collector with an active cascade seed heap separator has been developed (Figure 2) [20].

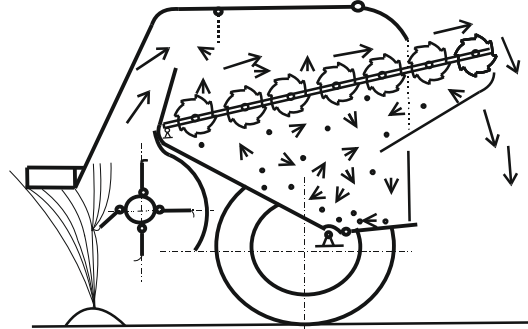
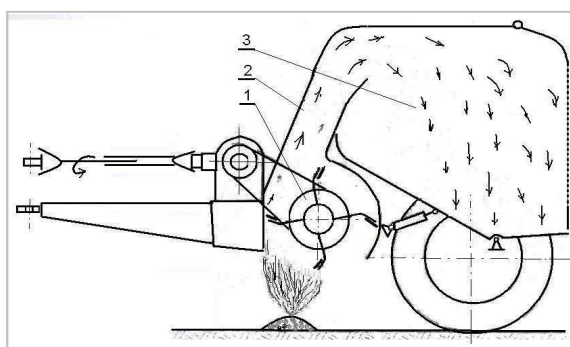


Figure 2. Scheme of a seed collector with an active separator.

The machine is equipped with a rotary cutter bar. In operation, the hanging knives of the rotary apparatus are cut off, the seed mass is partially crushed and directed through the deflector into the machine bunker. Here, the drums of the cascade separator separate the seed heap from the straw particles thrown onto the swath to enrich the soil with organic matter. The seed pile, which is collected at the bottom of the hopper, is prepared for sowing.

For the mechanization of hay harvesting from natural pastures, an improved design of the stacker mower has been developed (figure 3).

The mower is equipped with a rotary cutter bar 1, which is best suited to work in an abrasive environment. In the process of operation, the mowed mass due to the pulverizing effect and the air flow created by the rotor through the deflector 2 enters the hopper 3. As a certain portion is collected, the mowed mass is unloaded onto the swath in the form of compact heaps, joining them into rolls convenient for subsequent harvesting. After drying, the rolls are harvested in the form of pressed, chopped or loose hay using a baler, pick-up chopper or loader [21].



Machine diagram



Machine in operation

Figure 3. Mower-stacker

With regard to the control of pasture weeds, our studies have shown the most effective control by mowing weeds before insemination with collecting mass for hay or spreading over the stubble to enrich the soil with organic matter, depending on the suitability of the weeds for animal feed. The best machine for this purpose is a stacker mower (figure 3) with an improved hopper unloading system [22].

4. Conclusion

The production and provision of desert-pasture livestock farms with the special technical means described in this article will help strengthen the fodder base of animal husbandry - the basis for the dynamic development of the industry.

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