Abstract— The article provides evidence that about 20 million hectares of desert pastures of Uzbekistan allocated for livestock. To improve the condition of desert pastures, methods for determining the parameters of the distribution drum of the hopper of an innovative sowing seeder that satisfy the agrotechnical requirements for sowing seeds of desert fodder plants are presented.

Keywords: desert, semi-deserts, livestock, domestic animal, pasture, fodder plant, seed, seed mixture, agricultural crops, distribution apparatus, hopper, distribution drum.

I. INTRODUCTION

The total area of Uzbekistan is 44.78 million hectares. Of these, 32 million hectares of land consists of deserts and semi-deserts[1]. About 20 million hectares of desert pastures of Uzbekistan allocated for livestock. Domestic animals take 95-100% of the required useful feed in natural pastures. When feeding domestic animals, desert fodder plants play a significant role in her physico-mechanical properties of seeds and seed mixtures of desert fodder plants are very different from seeds and seed mixtures of agricultural crops. As a result of the low density and low friability of seeds and the high content, the remainder of plants and other satellite elements in the composition of the seed mixture and as a result of the existence of winged seeds cause problems during mechanized sowing of seeds.

II. FORMULATION OF THE PROBLEM

At present, one of the main problems in the field of sowing seeds is not obtaining the expected result during sowing of desert fodder plants with the help of seeders intended for

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The article deals with the task of sowing seeds of iszen, saxaul, teresken in a distance of 1 meter. To solve this problem, a “Program for remote-automatic control and monitoring of the sowing process of seeds of desert fodder plants (izen, saxaul and teresken) was created and CERTIFICATE No. DGU 06575 (13. 06.2019) was received from the intellectual property agency under the Ministry of Justice of the Republic Uzbekistan [9]. The task determines the number of seeds in each normalizing box of the distribution drum of the seeder hopper and the linear speed of rotation of the drum. The total volume of seeds in the box of the distribution drum is calculated by the formula:

\[ V_u = \frac{u_t \cdot t_k \cdot z \cdot h \cdot l}{10000} \]  

(1)

Here, \( u_t \) - fill factor of the normalizing box with; \( t_k \) - seed purity,%; \( z \) - width of the normalizing box, m; \( h \) - height of the normalizing box, m; \( l \) - length of normalizing box, m.

The total mass of seeds in the box of the distribution drum is calculated by the formula:

\[ m_{u} = \gamma \cdot V_u \]  

(2)

Here is the \( \gamma \)-average seed density (bulk density).

The number of seeds in the box of the distribution drum is calculated by the formula:

\[ n_u = \frac{1000 \cdot m_{u}}{u_l} \]  

(3)

Here \( m_{u} \) is the mass of one seed.

The cyclic frequency of rotation of the drum (angular velocity) is calculated by the formula:

\[ \omega = 2 \cdot \pi \cdot v \]  

(4)

Here \( \pi = 3.14 \); \( v \) - drum rotation frequency (m/min);

The linear speed of rotation of the drum is calculated by the formula:

\[ v_b = \omega \cdot r = \frac{2 \cdot \pi \cdot v \cdot r}{60} = \frac{\pi \cdot v \cdot r}{3000} \]  

(5)

Here \( r \) - drum radius, m. The difference in the sowing time of seeds of two adjacent normalizing boxes is equal to the time where the subsequent normalizing box takes the place of the position of the previous normalizing box. This time period is calculated by the formula:

\[ t = \frac{z}{100 \cdot v_b} \]  

(6)

Distances where the subsequent normalizing box takes the place of the previous normalizing box equal to the width of the normalizing box. Sowing distances of seeds contained in one normalizing box is calculated by the formula:

\[ s = v_t \cdot t \]  

(7)

Here \( v_t \) - tractor speed.

To determine the number of seeds sown per 1 meter, we compose the following proportion:

\[ \frac{s}{l} = \frac{n_u}{x} \]  

(8)

From this proportion, we determine the number of seeds \( x \) located in 1 m according to the formula:

\[ x = \frac{n_u}{s} = \frac{n_u}{v_t \cdot l} \]  

(9)

The novelty of the innovative seeder is the installation of a distributor drum in the hopper of the sowing section. In the technological process of work, the distribution drum prevents the destruction and crushing of seeds, and has almost no mechanical effect on them. As a result, high-quality sowing of seeds and increase their germination will be achieved.

IV. METHODOLOGY

Solution Method to determine the parameters of the proposed wide-seeding sowing unit, a theoretical study was conducted. When determining the parameters of the distribution drum, the indicators of the physical and mechanical properties of desert fodder seeds are taken as a basis.

The average volumetric weight of the sown seeds of desert fodder taken \( \gamma = 0.25 \) g/cm3, the radius of the distribution drum from \( R_b = 2.5 \) cm to 12.5 cm in increments of 2.5 cm, the value of the number of revolutions of the drum \( n = 0.5 \) rpm to 15.5 rpm in increments of 0.5 rpm; width of a measuring cell from \( z = 0.3 \) cm to 1.5 cm in increments of 0.3 cm; its height is from \( h = 0.3 \) cm to 1.5 cm in increments of 0.3 cm; length from 5 cm to 25 cm in increments of 5 cm; tractor speed \( v_t = 0.8 \) m/s. Up to 2.4 m/s in 0.4 m/s increments. Seed purity for 30% of seeds = 30% to 70% in 5% increments.

The following table shows the parameters of an innovative seeder that provides the process of sowing seeds of desert fodder plants.

<table>
<thead>
<tr>
<th>№</th>
<th>Name of the parameters</th>
<th>Unit of measurement</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The radius of the distribution drum</td>
<td>mm</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>The length of the distribution drum</td>
<td>mm</td>
<td>75</td>
</tr>
<tr>
<td>3</td>
<td>Rotation frequency of the distribution drum</td>
<td>m/s</td>
<td>1.0</td>
</tr>
<tr>
<td>4</td>
<td>The width of the normalization box</td>
<td>mm</td>
<td>0.5</td>
</tr>
<tr>
<td>5</td>
<td>The height of the normalization box</td>
<td>mm</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>The length of the normalization box</td>
<td>mm</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>The diameter of the distribution drum</td>
<td>mm</td>
<td>75</td>
</tr>
<tr>
<td>7</td>
<td>Saturation coefficient of the normalization box %</td>
<td>%</td>
<td>90</td>
</tr>
<tr>
<td>8</td>
<td>The speed of the tractor</td>
<td>%</td>
<td>50-75</td>
</tr>
</tbody>
</table>
As an example, we consider the dependence of sowing seeds on the change in the radius of the distribution drum of the seeder from $r_d=2.5$ cm to 7.5 cm in increments of 0.5 cm.

a. Block Diagram

The following mathematical modeling algorithms are represented by block scheme

V. RESULT

The figures below show a graph of changes in seed sowing per meter distance, depending on the radius of the drum and the speed of the tractor. Figures 1 and 2 show that with the tractor speed and drum rotation speed at your request, you can sow seeds one meter away from 1 to 100 pieces.

![Graph of seed sowing per meter distance](image1.png)

Fig. 1. The graphical result of sowing seeds depending on tractor speed.

![Graph of seed sowing per meter distance vs. drum rotation speed](image2.png)

Fig. 2. The graphical result of sowing seeds depending on the radius of the drum.

This shows that the number of seeds planted in 1 m increases proportionally with an increase in the radius of the distribution drum of the seed hopper.

VI. CONCLUSION

The parameters of the distribution drum of the hopper of the recommended innovative seeder are determined. When sowing seeds of desert fodder plants with the help of innovative seeders, the hopper distribution drum prevents the breaking and crushing of seeds and almost does not affect the seeds mechanically. As a result, the seeds are sown qualitatively, their fertility is increased. Such seeders satisfy the agrotechnical requirements of desert fodder plants supplied for sowing.

REFERENCES

9. E.T. Farmonov, A.N. Sadyrov, Sh.A. Aynakulov and others. “Program for remote-automatic control and monitoring of the sowing process of seeds of desert fodder plants (izen, saxaul and teresken) was created and CERTIFICATE No. DGU 06575 (13.06.2019) was received from the intellectual property agency under the Ministry of Justice of the Republic Uzbekistan.