

DETERMINATION OF THE PARAMETERS OF THE CHANNEL WHEEL OF THE MACHINE FOR PREPARING SOIL FOR SOWING SMALL SEEDS.

Savriddinov Abrorjon Anvar ugli,
doctoral student
Juraev Fazliddin Urinovich,
D.Sc., Professor
Juraev Asliddin Nasriddin ugli,
D.Sc., Assoc. Prof.

Annotation: This article discusses the structure, operating process, changes in the distance between the rods, and determining the diameter and parameters of the roller for preparing soil for sowing small seeds. In addition, information is provided on the purpose and manufacture of the roller.

Keywords: Soil, roller, harrow, rod, seed, clod, penetration depth, layer.

The diameter of the machine's rod roller is determined by the following expression, derived from the condition of overtaking clods encountered on its path without moving them forward:

$$D_p = \frac{[1 + \cos(\varphi_1 + \varphi_2)] d_k + 2h_0}{1 - \cos(\varphi_1 + \varphi_2)}, \quad (1.1)$$

where d_k - clods encountered on the path of the machine's rod roller diameter, m;

h_0 - depth of penetration of the rod roller into the soil, m.

If condition (1.1) is not met, clods found in front of the machine's rod roller accumulate in front of it, leading to disruption of the technological process.



Figure 1.1. View of the roller

The depth of penetration of the rod roller into the soil is determined from the condition that the layer loosened by it with arrow-shaped paws is compacted to the required level according to the following expression:

$$h_0 = h_i \left(1 - \frac{\rho_0}{\rho_1}\right) = K_h h \left(1 - \frac{\rho_0}{\rho_1}\right), \quad (1.2)$$

where h_i - layer thickness, m;

P_0, P_1 - respectively, softened by the machine's arrow-shaped paws before the impact of the rod roller and the impact of the layer

Densities after , kg/m³;

K_h - soil volume as a result of loosening by arrow-shaped paws coefficient that takes into account the increase.

Taking into account (1.2), expression (1.1) will have the form:

$$D_p = \frac{1 + \cos(\varphi_1 + \varphi_2) d_k + 2K_h h \left(1 - \frac{\rho_0}{\rho_1}\right)}{1 - \cos(\varphi_1 + \varphi_2)}. \quad (1.3)$$

$d_k = 0,1$ m, $K_h = 1,1$, $\rho_0 = 1020$ va $\rho_1 = 1150$ kg/m³ and substituting the above values of φ_1 , φ_2 and h into expression (1.3), we determine that the diameter of the machine's rod roller should be at least 26.4 cm.

The number of rods installed on the machine roller is determined by the following expression, derived from the condition of their complete processing of the field surface:

$$n_p = \frac{4\pi D_p (1 + k_c)}{\pi - 2 \arcsin \left(1 + \frac{2h_0}{D_p}\right) - 2 \cos \arcsin \left(1 + \frac{2h_0}{D_p}\right) + 2b_p}, \quad (1.4)$$

where k_c - sliding coefficient of the machine roller;

b_p - roller rod thickness, m.

Taking into account (1.2), expression (1.4) will have the following form;

$$n_p = \frac{4\pi D_p (1 + K_c)}{\pi - \arcsin \left(1 + \frac{2K_h h (\rho_1 - \rho_0)}{D_p \rho_1}\right) - 2 \cos \arcsin \left(1 + \frac{2K_h h (\rho_1 - \rho_0)}{D_p \rho_1}\right) + 2b_p}. \quad (1.5)$$

(1.5)

Taking $K_c = 0.1$ and $b_p = 0.006$ m and substituting the above determined and given values of D_p , K_h , h , ρ_0 , ρ_1 , we determine that at least 10 rods must be installed on the machine roller.

The minimum load on the machine's roller is determined from the condition of working at a specified depth using the following expression:

$$Q = q_0 (1 + k_v v^2) B h_0 b_p + b_a \frac{D_p}{2} - h_p + h_a$$

$$\sqrt{2 \frac{D_p}{2} - h_p + h_a (h_0 - h_p + h_a) - (h_0 - h_p + h_a)^2} -$$

$$- \frac{D_p}{2} - h_0 + h_a \arcsin \frac{\sqrt{2 \frac{D_p}{2} - h_p + h_a (h_0 - h_p + h_a) - (h_0 - h_p + h_a)^2}}{\frac{D_p}{2} - h_p + h_a}$$

$$\frac{B}{l_a} + 1 \quad , \quad (1.6)$$

where q_0 - coefficient of volumetric crushing of soil, N/m³;

k_v - coefficient of proportionality, s²/m²;

V_i - translational speed of the machine (roller), m/s;

B - working width of the machine (roller), m;

h_p - roller rod height, m;

h_a - height of the part of the roller rod entering the base, m;

l_a - distance between roller bases, m.

Taking into account (1.2) we reduce (1.6) to the following form

$$Q = q_0 (1 + K_v V^2) \frac{BK_h h}{\rho} (\rho - \rho_0) b_p + b_a \frac{D_p}{2} - h_p + h_a$$

$$\sqrt{2 \frac{D_p}{2} - h_p + h_a \frac{K_h h}{\rho} (\rho - \rho_0) - h_p + h_a - \frac{K_h h}{\rho} (\rho - \rho_0) - h_p + h_a}^2 -$$

$$- \frac{D_p}{2} - \frac{K_h h}{\rho} (\rho - \rho_0) + h_a$$

$$\arcsin \frac{\sqrt{2 \frac{D_p}{2} - h_p + h_a \frac{K_h h}{\rho} (\rho - \rho_0) - h_p + h_a - \frac{K_h h}{\rho} (\rho - \rho_0) - h_p + h_a}^2}{\frac{D_p}{2} - h_p + h_a}$$

$$\frac{B}{l_a} + 1 \quad . \quad (1.7)$$

$h_a = 0.02$ m, $l_a = 0.53$ m, calculations according to expression (1.7) at speeds of 1.7-2.5 m/s, a vertical load of 0.99 kN should be applied to the machine's coil.

LITERATURE

1. А.Д.Джураев, А.Тўхтақўзиев, Ж.Мухамедов, В.Турдалиев. “Тупрокка экиш олдида ишлов берувчи ва майда уруғли сабзавот экинларини экувчи комбинациялашган агрегат”. Toshkent-2016.
2. F.O‘Jo‘rayev, A.A.Savriddinov, A.N.Jo‘rayev, Respublikamiz kichik konturli dehqon xo‘jaliklari yerlarini ekishga tayyorlashda qo‘llaniladigan kombinatsiyalashgan mashinaning tahlili./AGRO ILM №2 [108], 2025.
3. M.M.Makhmudova U.I.Khasanov, A.A.Savriddinov // The Results of the Study of the Compactions of the Bottom of the Furrow in Plowing by Plug Corpusies as well as Tractor Wheels
4. Savriddinov Abrorjon Anvar o‘g‘li (2024). Значение дневных машин в освоении новых земель.
5. M.Shoumarova, T. Abdillayev // Qishloq xo‘jaligi mashinalari., TOSHKENT – 2018.
6. Jo‘raev Asliddin Nasriddin o‘g‘li / Tuproq qatqalog‘ini g‘o‘za nixollariga ta‘siri va uni yumshatishda qo‘llaniladigan resurstejamkor mashinalar taxlili. / "effectiveness of using innovative technologies in agriculture and water management" 2024 year The 23-24 rd of February Bukhara
7. А. Н.Устинов / Сельскохозяйственные машины / Москва-2012
8. Sh.J.Imomov A.A.Jo‘rayev, S.S. Orziyev, M.Z.Ochilov, O‘.F.Husenov / Qurilma yoysimon qoliplarining pnevmosilindrlari bosiminingbiogumus tuvakcha sifat ko‘rsatkichlariga ta‘siri // “Suv xo‘jaligini barqaror rivojlantirishda innovatsion texnologiyalarning ahamiyati” mavzusidagi xalqaro ilmiy va ilmiy-texnikaviy anjumani 1(22)-son 2024
9. Sh.J.Imomov, S.S. Orziyev, S.S.To‘rayev, O‘.F.Husenov / Biogumus tuvakchalari tayyorlash qurilmasi yuklash idishini siqish silindriga o‘rnatilish burchagini va siqish silindri uzunligini asoslash / “O‘zbekiston agrar fani xabarnomasi” jurnali
- 10 Savriddinov Abrorjon Anvar ugli, Juraev Fazliddin Urinovich, Juraev Asliddin Nasriddin ugli. (2026). DESCRIPTION OF THE STRUCTURE AND WORKING PROCESS OF A MACHINE FOR PREPARING SOIL FOR SOWING SMALL SEEDS. *Ethiopian International Journal of Multidisciplinary Research*, 13(1), 1106–1112. Retrieved from <https://www.eijmr.org/index.php/eijmr/article/view/4872>