Placement of plow working bodies for plowing soil slopes

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Abstract. The paper studies the direction turnover layers along slope and placement of working bodies on a plow for plowing slope fields. The diagrams of the turnover of layers on the slope and the layout of the working bodies on the plow are given. It is proved that intermittent grooves ridges, according to agro technical requirements, it is necessary to rotate the layers downhill. It was found that when installing a cut-out spherical disk behind the front cases, a groove is formed above the a is under it. The subsequent layer wrapped in an even body. At the same time, rainwater is sub-arable of soil, which prevents water erosion. The results of one-factor experiments using strain-measuring methods are presented. It has been established that to ensure complete turnover of the layers within their own furrow by the hulls and the formation of the required ridges and intermittent grooves longitudinal distance between and toe even-numbered body ploughshare should be at least 110 cm.

1 Introduction

Spherical disks are widely used to prevent water erosion on slope fields [1]. Symmetrical, eccentric and cut-out discs are used for this [1]. Eccentric discs are used to form anti-erosion grooves on the soil surface [2, 3]. On the plough-rippers for non-shaft processing of slopes, spherical disks are installed behind the rippers with an inclined rack. Sh Mardonov [4] substantiated the basic parameters of an all-edged spherical disk, studied the range of flight of soil particles under the influence of the disk. F Mamatov [3], B Mirzaev [3, 10], K Ravshanov [2, 4, 8], Kh Fayzullayev [4], D Chuyanov [5], S Alikulov [6], S Komiljonov [7], Sh Gapparov [9] the nature of the interaction of the levium of the disk working organ with the cut material has been studied. Turnover of layers and the relative location of the plow workers for plowing the soil of the slopes are not considered [9]. The authors have developed a plow for smooth plowing with cut-out discs. Direction turnover layers along slope and the placement of working bodies on a plow for plowing slope fields.

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2 Materials and methods

To justify the placement a stepped plow plowing of slopes, first of all, it is necessary to justify the directions of the turnover of layers along the slope. Slope fields can be formed on the surface of the plow in two ways: in the case of turning the blade cut by a spherical disk up (Figure 1a) and down (Figure 1b) on the slope. When tipped up the slope, the overturned plow may not be completely tipped and may partially roll the soil back into the ditch. This leads to the failure to create moats of the required height and depth of ditches. At the same time, the formed ditches will be ineffective, because they do not collect rainwater after mowing. These negative situations are eliminated when the slats are turned down on the slope. Therefore, it is advisable to turn the plows down only on the slope with a spherical disc on a step-shaped plow that plows flat without an edge. For this, a spherical disc is equipped with a twisting mechanism. The parameters of the twisting mechanism are based on Sh. Mardonov. Therefore, in this work, the parameters of the spherical disk turning mechanism are not considered [4].

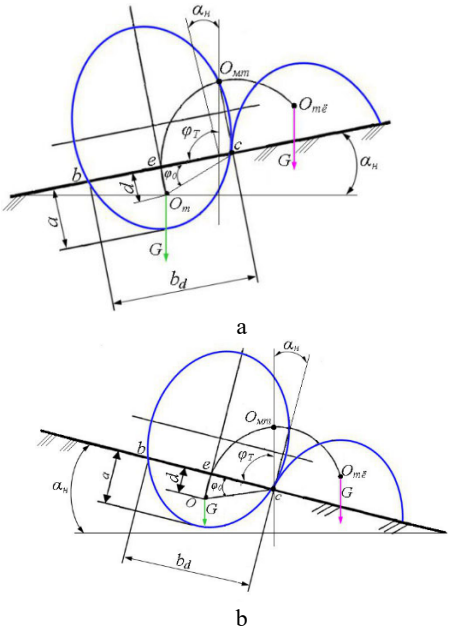


Fig. 1. Schematics of tilting the palace up (*a*) and down (*b*) on the slope.

The angle of non-steady position of the blade on the slopes depends on slope φ_m and rotation of blade, i.e.

$$\varphi_m = \frac{\pi}{2} \pm \alpha_н . \tag{1}$$

As can be seen from Figure 1, the angle of instability decreases when the blade is rotated downward, and increases when the blade is rotated upward. So, when the blade is rolled up the slope, its tipping becomes worse. As the slope of the slope increases, the slope of the slope improves. This, in turn, ensures the formation of demand-level moats and continuous ditches. Therefore, it is necessary to adjust the truncated spherical discs to turn the blades down the slope.

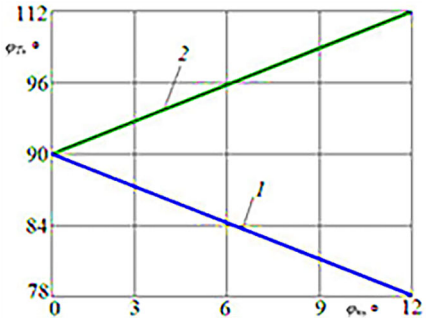


Fig. 2. Graphs of the change of the angle of non-steady state of the blade (φ_m) depending on the slope of the slope (φ_n) º.

The body, the hollow softener and the truncated spherical disk can be placed in three different positions. In the first case, the truncated spherical disk is placed after the housing without a cavity softener (Figure 2). In this case, rainwater collects in the ditches formed in the palakhsa (Figure 3). This can cause water that has not been absorbed into the soil under the field to wash away the scythes during heavy rains.

In the second case, the spherical disk can be installed along the field edge of the first case. In this case, and turns at junction first and second blades. It is known that in some cases, the palaxa does not turn over completely within the limits of its edge. This leads to the formation of a gap between the palaxa and the bottom of the egate. In this case, the rainwater collected in the formed ditch collects in the cavity and causes the soil to be washed away.

In the third case, the truncated spherical disk can be installed behind the first housing with a hollow softener. In this case, the spherical disk cuts the soil of the overturned plow with the first body, and the second body throws it on the overturned plow. In this case, a ditch is formed above the first layer, and a softened subsoil is formed below it. And the sickle is formed on the second, i.e. the next body overturned palakhsa (Figure 3). The overturned soil ensures that this plant is fully seated in its own position. In this case, the rainwater collected in the ditch is absorbed into the softened agate bottom, which prevents water erosion. Thus, it is appropriate to place the working bodies according to the third scheme.

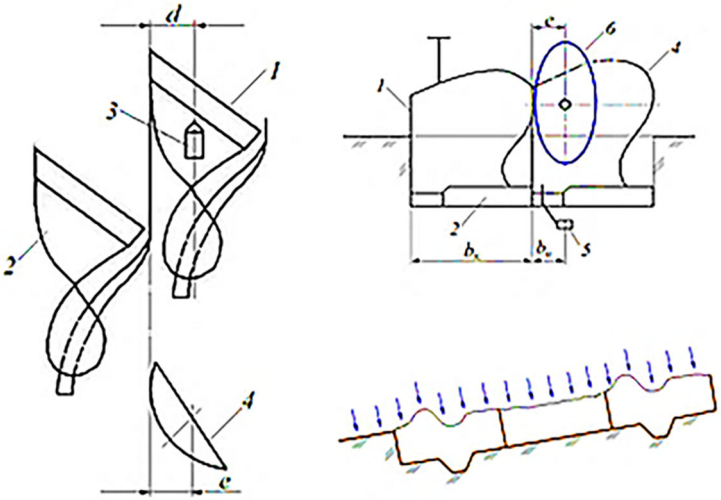
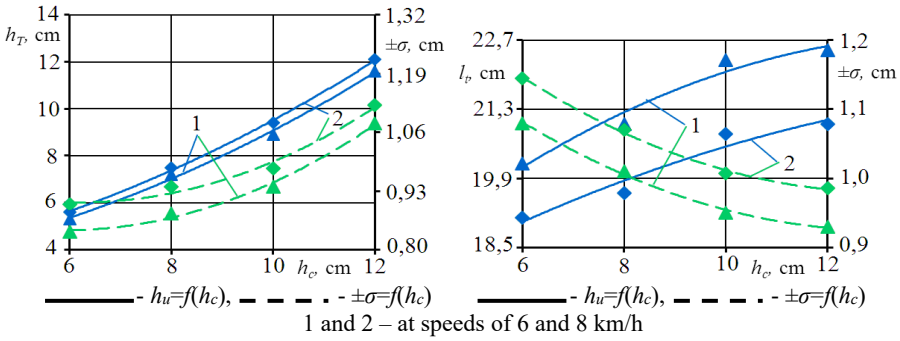


Fig. 3. Mutual arrangement of the body, subsoiler and spherical disk (*a*), cross-section of the field after plow processing (*b*): 1 – front body; 2 - second; 3 – plower; 4 – subsoiler; 5 – disk.

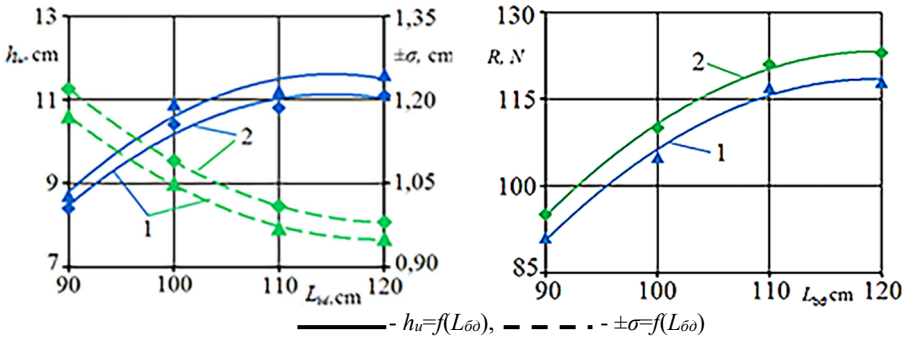
3 Results and discussion

From the results obtained (Figure 4) it can be seen that with an enhancement in the lateral distance between the cut-out spherical disk and the toe of the share plowshare of an even body, the depth of the groove, the height of the ridge and the traction active resistance increasing. With an increase in this distance of more than 110 cm, the given indicators change slightly. Depending to the data of the conducted trial-trip (Figure 4), it was found that in order to form the required grooves and ridges with the least energy consumption, the axial ambit between the cut-out spherical disk and the even body should be at least 110 cm.



1 and 2 – at speeds of 6 and 8 km/h

Fig. 4. Schedule dependencies height (h_T) and width barrier (l_t) on the depth sector (h_c) cut-out spherical disk.



1 and 2 – at speeds of 6 and 8 km/h

Fig. 5. Schedule dependencies of the height (h_u) and width barrier (R) on the depth of the sector (L_{bd}) cut-out spherical disk.

4 Conclusions

For the formation of intermittent furrows and ridges on the surface of arable land, according to agro technical requirements, it is necessary to rotate the layers downhill. It was found that when installing a cut-out spherical disk behind the front cases, a groove is formed above the first layer, and a loosened stepped profile is formed under it. The ridges are formed over the subsequent layer, wrapped in a black body. At the same time, rainwater accumulated in the grooves is engrossed into the loosened sub-arable soil layers, which prevents water erosion. In order to ensure a complete rotation of the groups within their own furrow by the hulls and the formation of the required ridges and intermittent grooves on the surface of the arable land, the longitudinal interval between the cut-out spherical disk and the even hull should be at least 110 cm.

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