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# JUSTIFICATION FOR THE PLACEMENT OF THE WORKING BODIES OF THE PLOUGH FOR PLOWING ON THE SLOPES

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## Abstract

The article examines the direction of rotation of layers along the slope and the placement of working bodies on the plow when plowing slope fields. Diagrams of the rotation of layers on a slope and the location of the working bodies on the plow are presented and the results of one-factor experiments using strain gauge methods are presented, a diagram of the inclination of the palace up and down the slope, and also a diagram of the change in the angle of the unsteady position of the blade depending on the steepness of the slope, the relative position of the body, ripper and spherical disc.

**Keywords:** Spherical disk, slope field, soil, plow, body, ripper, ridges, parameters, mechanism, plowing height and depth, steepness.

## Introduction

Spherical discs are widely used to prevent water erosion on sloped fields. For this purpose, symmetrical, eccentric and cut-out discs are used [1]. Eccentric discs are used to form anti-erosion grooves on the soil surface [2]. On plow-rippers for shaftless processing of slopes, spherical discs are installed behind the rippers with an inclined stand. Sh. Mardonov substantiated the main parameters of a solid-edged spherical disk, studied the flight range of soil particles under the influence of the disk. F. Mamatov, B. Mirzaev, K. Ravshanov, Sh. Gapparov studied the nature of the interaction of the levium of the working body of the disk with the cut material. The turnover of layers and the relative position of plows when plowing soil on slopes are not taken into account [3]. The authors have developed a plow for level plowing with cut-out discs. The direction of rotation of layers along the slope and the placement of working parts on the plow for plowing slope fields. To justify the placement of stepped plow plowing of slopes, it is first necessary to justify the direction of rotation of the layers along

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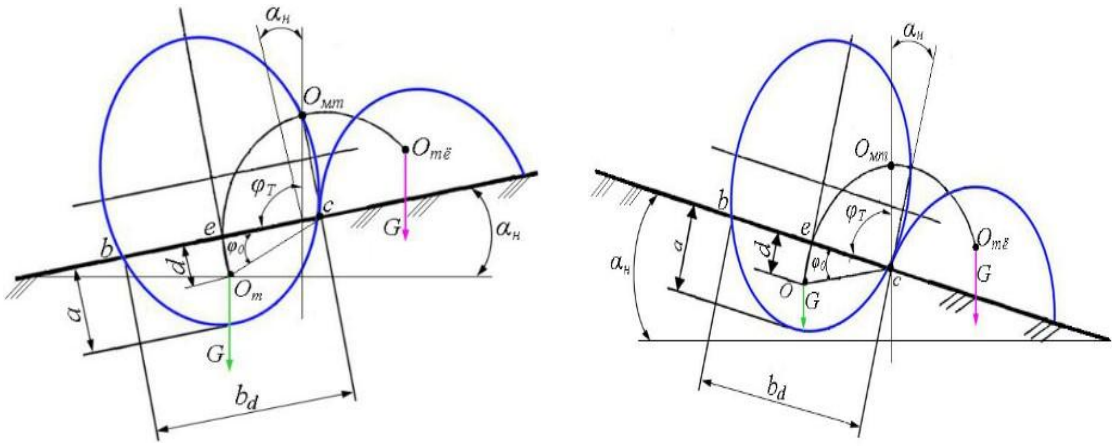
the slope. Sloping fields can be formed on the surface of the plow in two ways: in the case of turning the blade, cut by a spherical disk, up (Fig. 1a) and down (Fig. 1b) along the slope.




**Rice. 1.** Scheme of the palace tilting up (a) and down (b) the slope.

When tipping up a slope, an overturned plow may not tip over completely and may cause some of the soil to roll back into the ditch. This makes it impossible to create ditches of the required height and depth of the ditches. In this case, the resulting ditches will be ineffective because they do not collect rainwater after mowing. These negative situations are eliminated by turning the slats down the slope. Therefore, it is advisable to turn the plows down only on a slope with a spherical disk on a stepped plow, which plows smoothly, without a lip. For this purpose, the spherical disk 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 rotation mechanism are not considered [3].

The angle of the non-stationary position of the blade on the slopes depends on the angle of inclination φт and rotation of the blade, i.e.

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

As can be seen from Figure 1, the instability angle decreases as the blade rotates downward and increases as the blade rotates upward. Thus, when the blade is rolled up a slope, its tipping becomes worse. As the steepness of the slope increases, the steepness of the slope improves. This, in turn, ensures the formation of moats and continuous ditches at the level of demand. Therefore, it

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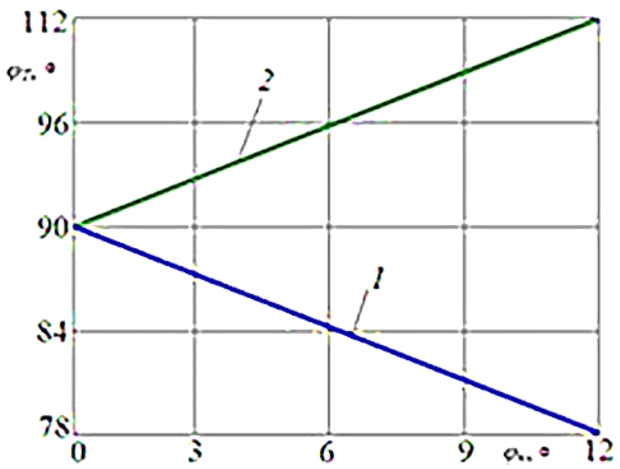
is necessary to adjust the truncated spherical disks to turn the blades downhill. The body, hollow softener and truncated spherical disc can be placed in three different positions. In the first case, a truncated spherical disk is placed after the body without a cavity softener (Fig. 2). In this case, rainwater is collected in ditches formed in the palakhsa (Fig. 3). This can result in water that is not absorbed into the soil beneath the field and can wash away the spits during heavy rains.

In the second case, a spherical disk can be installed along the edge of the field of the first case. In this case, it turns at the junction of the first and second blades.




**Rice. 2.** Graphs of changes in the angle of the unsteady position of the blade (φт) depending on the steepness of the slope (φн) °.

It is known that in some cases the palaxa does not turn over completely within its edge. This leads to the formation of a gap between the tent and the bottom of the egate. In this case, rainwater collected in the resulting ditch collects in the cavity and causes soil to be washed away.

In the third case, a truncated spherical disk can be installed behind the first housing with a hollow softener. In this case, the spherical disk with its first body cuts the soil of the inverted plow, and the second body throws it onto the inverted plow. In this case, a ditch is formed above the first layer, and softened soil below it. Moreover, the sickle is formed on the second, i.e., the next body of the inverted palakhsa (Fig. 3). Turning the soil over ensures that this plant sits completely in place. In this case, rainwater collected in the ditch is absorbed into



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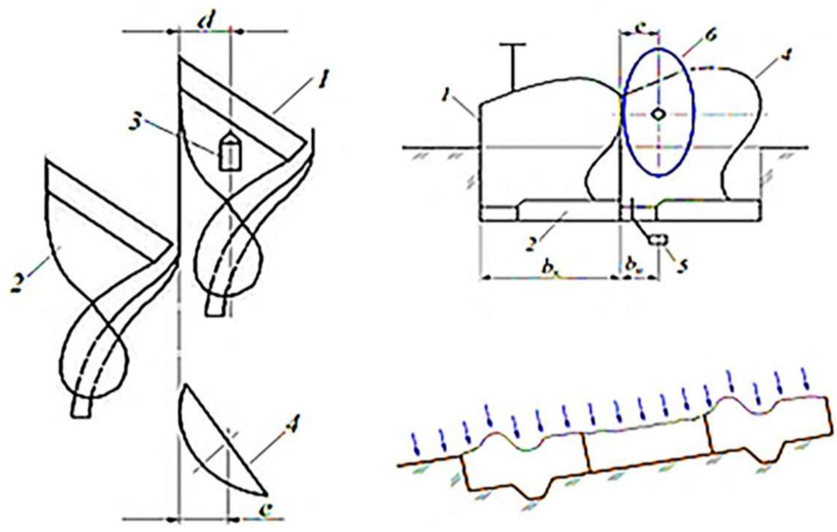
the softened agate bottom, which prevents water erosion. Thus, it is advisable to place the working bodies according to the third scheme.



**Rice. 3.** The relative position of the body, ripper and spherical disk (a), cross-section of the field after processing with a plow (b): 1 – front body; 2 – second; 3 – plow; 4 – subsoiler; 5 – disk.

Из полученных результатов (рис. 4) видно, что с увеличением бокового расстояния между вырезанным сферическим диском и носком лемеха лемеха ровного корпуса увеличивается глубина канавки, высота гребня и тяговое активное сопротивление увеличивается. При увеличении этого расстояния более 110 см данные показатели изменяются незначительно. По данным проведенной пробной поездки (рис. 4) установлено, что для формирования необходимых канавок и гребней с наименьшими энергозатратами осевой размер между вырезанным сферическим диском и ровным телом должен быть не менее 110 см.



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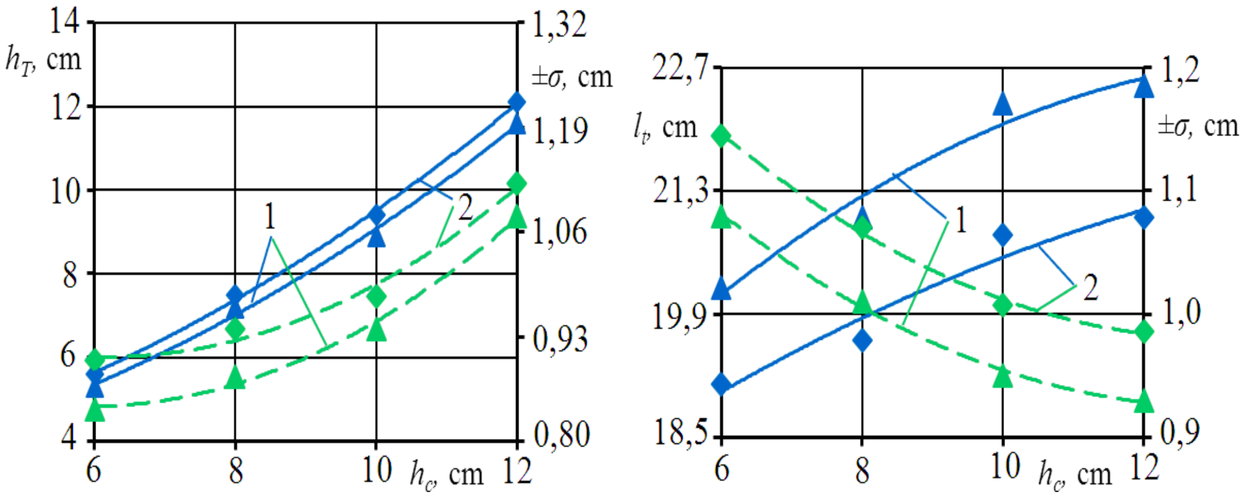
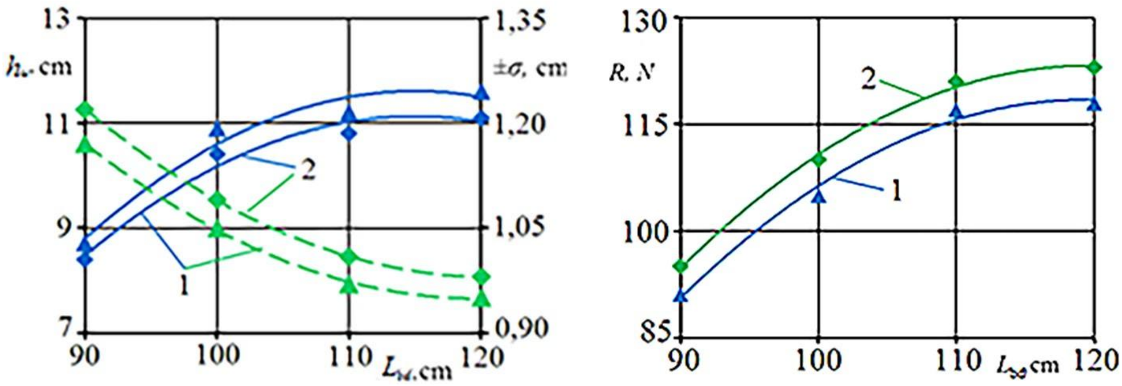



1 and 2 – at speeds of 6 and 8 km/h.

**Рис. 4.** График зависимости высоты ($h_T$) и ширины барьера ($l_t$) от глубины сектора ($h_c$) выреза сферического диска.




1 and 2 – at speeds of 6 and 8 km/h.

**Rice. 5.** Graph of the height (hu) and width of the barrier (R) versus the sector depth (Lbd) of the spherical disk cutout.

**Conclusions**

To form intermittent furrows and ridges on the surface of the arable land, according to agrotechnical requirements, it is necessary to rotate the layers downhill. It has been established that when installing a cut spherical disk behind the front housings, a groove is formed above the first layer, and a loosened stepped profile is formed under it. The ridges form above the subsequent layer, wrapped in a black body. At the same time, rainwater accumulated in the furrows is absorbed into the loosened subsoil layers, which prevents water erosion. To ensure complete rotation of the groups within their own furrow by the bodies and the formation of the necessary ridges and intermittent furrows on the surface of the arable land, the longitudinal interval between the cut spherical disk and the flat body must be at least 110 cm.

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