

"INVESTIGATION OF THE LONGITUDINAL DISTANCE BETWEEN THE BODIES OF A TWO-BOTTOM PLOUGH USED FOR PRIMARY SOIL TILLAGE"**Ortikov V.B.**

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Abstract: The article presents the research method of changing the longitudinal distance between the shells. As a result of the study, increasing the longitudinal distance between the bodies leads to an increase in the mass of the plow and naturally to an increase in the effort spent in pulling it in the furrow, and also reducing the distance leads to seizure of the formation between the bodies, which also leads to an increase in the traction resistance of the plow. The article examines the significance of two-tier plows in agriculture, focusing on their structural characteristics and efficiency.

Keywords: Two-tier plow, soil fertility, energy efficiency, soil cultivation, agro-technology, traction resistance, formation, soil, friction angle, deformation.

In modern agriculture, the improvement of soil tillage technologies is an important factor in increasing productivity and maintaining soil fertility. Compared to traditional plows, double-row plows (Two-tier plow) play an important role in better preserving soil structure and optimizing the tillage process.

A number of scientific studies have been conducted in foreign countries on the effectiveness of two-tier plows, the main directions of which are summarized as follows:

Scientific research on the development of two-tier ploughs for soil cultivation, the substantiation of their parameters, as well as the processes of interaction between the working bodies and the soil, has been carried out by R. Davies, G. N. Sineokov, V. F. Strelbiskiy, F. M. Kanarev, P. S. Nartov, G. Teslyuk, and others. In this field, researchers from our republic such as F. M. Mamatov, A. To'xtaqo'ziev, B. M. Xudayarov, A. R. Normirzaev, A. N. Xudoyorov, H. T. Qirg'izov, M. M. Ergashev, N. Sh. Rashidov, S. P. Chirsov, and other scientists have also conducted scientific studies.

The machines and equipment developed based on the results of these studies have been successfully applied in agricultural production, yielding certain positive outcomes.

As a result of the use of two-tier plows, the upper and lower layers of the soil are cultivated separately. This allows for a deeper development of the plant root system and a more uniform distribution of nutrients. Studies show that the use of Two-tier plow improves the physicochemical properties of the soil.

As Two-tier plow cultivates the soil with less resistance compared to traditional plows, tractor fuel consumption is reduced. For example, studies conducted in the USA and Germany have shown that the use of two-tier plows reduces energy consumption by 15-20%. [1, 2].

An analysis of the work carried out allows us to conclude that when determining the longitudinal distance between the hulls, it is necessary to proceed from the condition of unhindered chipping of the

soil layer, i.e. the longitudinal distance between the hulls should be such that the deformation zone of the soil layer by the hull does not reach the structural elements of the previous hull.

The actual angle ψ of chipping of the soil, i.e. the angle of inclination of the chipping plane to the horizon, is determined by soil conditions (friction angles) and the parameters of the ploughshare, it can be determined by the following well-known expression [6; 9; 10.]

$$\psi = 90^\circ - \frac{\varepsilon + \varphi_1 + \varphi_2}{2} \quad (1)$$

where is

ε the angle of the ploughshare installation to the bottom of the furrow;

φ_1 - the angle of friction of the soil on the steel, degrees.;

φ_2 - the angle of friction of the soil on the soil, degrees.

Studying the effect of the plow's speed on the angle of inclination of the cleavage plane to the horizon, many scientists have concluded that this angle changes slightly with increasing speed. He found that the values of the horizontal and vertical angle of lateral cleavage depend more on the physical and mechanical properties of the soil than on the geometric parameters of the working organs.

The longitudinal distance l between the two-tier plow housings of the same name can be represented as

$$l = l_1 + l_2 \quad (2)$$

where is

l_1 is the longitudinal distance between the lower tier body and the upper tier body following it.,

l_2 -the longitudinal distance between the body of the lower tier and the body of the upper tier located in front of it.

Let's establish the dependence of l_1 and l_2 on the design and technological parameters of the plow.

Let's determine the longitudinal distance l_1 between the tips of the ploughshares of the upper tier body and the previous lower tier body (**Fig.1**).

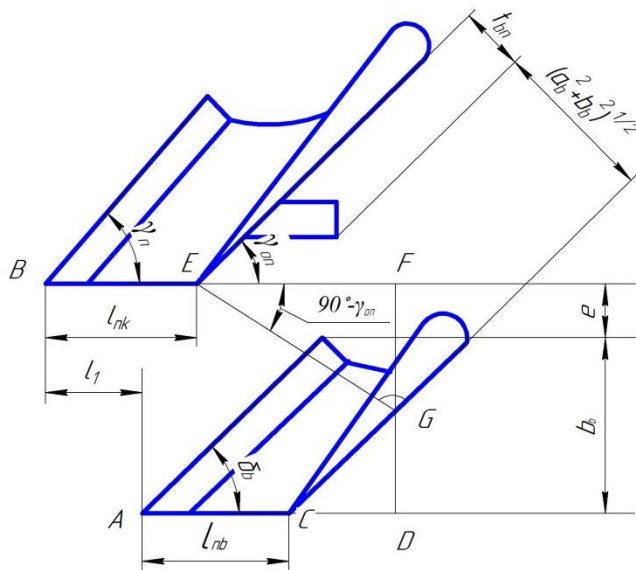


Fig.1. The scheme for determining the longitudinal distance l_1

It follows from the diagram in Fig.1 that $l_1 \geq BE + EF - AC - CD$ (3)

From the EFG triangle, $EF = (t_{bn} + \sqrt{(a_b^2 + b_b^2)}) \cdot \sin \gamma_{on}$; (4)

$FG = (t_{bn} + \sqrt{(a_b^2 + b_b^2)}) \cdot \cos \gamma_{on}$; (5)

where is t_{bn} - the thickness of the shoe of the lower tier body in orthogonal section,

a_b, b_b - thickness and width of the deposited soil layer by the upper tier body,

γ_{on} - the angle of inclination of the blade forming the body of the lower tier to the furrow wall [7; 11; 12.].

When determining the longitudinal distance between the body of the lower tier and the body of the upper tier located in front of it, we assume (Fig. 2) that the body of the upper tier is located at such a distance in front of the body of the lower tier, at which the line of intersection of the cleavage plane with the plane of the bottom of the furrow of the body of the upper tier coincides with the trace on this plane of the leading edge of the shoe of this body.

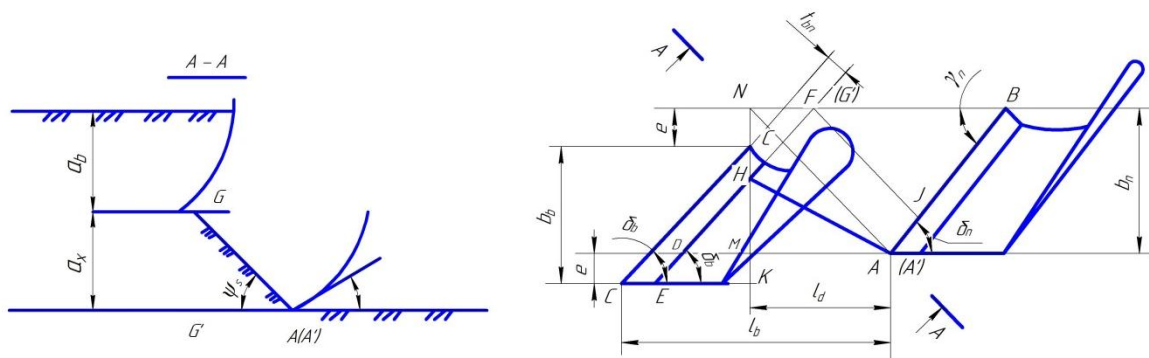


Fig.2. The scheme for determining the distance l_2

It follows from triangle AGG^1 that $AG^1 = a_x \cdot \text{ctg } \Psi_s$, (12)

From the triangle ANM and Figure 2 $AH = a_x \frac{\text{ctg } \Psi_s}{\cos \Psi \delta_x}$, (13)

From the analysis of the obtained dependences, it follows that the transverse displacement of the upper body relative to the lower one has a significant effect on the values of l_1 and l_2 : With an increase in e from 15 to 30 cm, the distance l_1 decreases from 38 to 22 cm, and the distance l_2 increases from 55 to 71 cm.

RESEARCH CONDUCTED IN UZBEKISTAN

A number of studies have been conducted in Uzbekistan on the implementation of Two-tier plow in the agricultural sector. These studies were mainly carried out in the following areas:

Improving the design of two-tier plows

Local scientists have managed to improve the quality of soil cultivation and reduce energy consumption by modifying the shape of the Two-tier plow working bodies based on spherical disks.

Assessment of agrotechnical indicators

As a result of field tests conducted by scientific institutes under the Academy of Sciences of the Republic of Uzbekistan, it was confirmed that the agrotechnical efficiency of Two-tier plow is higher than that of traditional plows. The effect on maintaining soil moisture longer, increasing the level of softness, and the development of the plant root system were positively evaluated. "Justifications of the longitudinal distance between the bodies of a two-body plough", this article show that, the present's results of theoretical studies on the justification of the longitudinal distance between the bodies of two-body plows. [3; 4; 5; 8]

Prospects for implementation

Research on the production of industrial samples of Two-tier plow is ongoing, and it is planned to test them in large-scale production conditions.

CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis conducted in this article, the following conclusions and recommendations are made:

Two-row plows are of great importance in agriculture, as they allow to increase soil fertility and reduce the risk of erosion. Foreign experience shows that the use of Two-tier plow increases energy efficiency and increases productivity.

The performed software calculations show that the longitudinal distances between the lower tier body and the upper tier body following it and between the lower tier body and the upper tier front body, depending on the magnitude of the transverse displacement of the upper body relative to the lower one, should be at least 32...38 and 55...60 cm, respectively.

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