Special Issue on Basis of Applied Sciences and Its Development in the Contemporary World
Published in Association with
Department of Technology and Organization of Construction, Samarkand State Architectural and Civil Engineering Institute, Uzbekistan
Department of Mechanization of livestock, Samarkand Institute of Veterinary Medicine, Uzbekistan
Novateur Publication India's International Journal of Innovations in Engineering Research and Technology [IJIERT]
ISSN: 2394-3696, Website: www.ijiert.org, 15th June, 2020

JUSTIFICATION OF THE POSITION OF THE PLOW RELATIVE TO THE BODY OF THE FRONT PLOW FOR SMOOTH PLOWING BETWEEN ROWS OF GARDENS

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Annotation: The article defines the position of the plow relative to the plow body for smooth plowing of the row spacing of gardens, the distance from the nose of the body to the pillar of the plow. The results of experimental studies to determine the position of the stopper relative to the body and its length are presented.

Keywords: coulter tine, replaceable plate, shallow plowing body, deep plowing body, soil layer, flat plowing, right and left module.

Introduction

Considering that the area under fruit crops in the world in 2019 amounted to 53.4 million hectares, out of more than 7 million hectares of olives, 20 million hectares of orchards, over 1.8 million hectares are occupied by citrus crops [1, 2] , orchards and vineyards in Uzbekistan amount to 385.6 thousand hectares, of which orchards make up 234.9 thousand hectares, vineyards - 150.7 thousand hectares [3, 4], one of the important tasks is to create machines and tools with new constructive solutions for the processing of the aisle of gardens, having a high productivity, meeting agro technical requirements and saving energy resources.

At the same time, special attention is paid to the creation and use of improved machines that carry out several technological processes in one pass between the rows of gardens. The use of new technologies and technical means in the main processing of row spacing to obtain

high yields in orchards requires timely and high-quality completion of plowing of row spacing on the basis of agro technical requirements.

At present, all the country's horticultural farms use general purpose plows of the PN-3 / 4-35, PN-4-25 brands and garden plows of the PS-4-30, PS-3-30, PS-4 brands for plowing the aisles of gardens. -30A, PSV-120-50, PLS-5-25A, PV-1.7 and PSG-3-30A. This makes it difficult to carry out year-round work after traditional plowing methods using garden machines. To get the job done at the required level, it will be necessary to level the soil piles and holes formed after traditional row-spacing plowing. This, in turn, leads to additional costs of time, labor, technology and energy.

To solve the above problems, studies were carried out on the theoretical substantiation of the optimal mutual position of the working bodies of the frontal plow for smooth plowing of the aisle of gardens and experimental studies were carried out to verify the results obtained.

The zapludnik is used to move the layer overturned by the body towards the body. The coordinated interaction between the reservoir, the body and the stopper, that is, their influence in certain phases, depends on their relative position (Fig. 1).

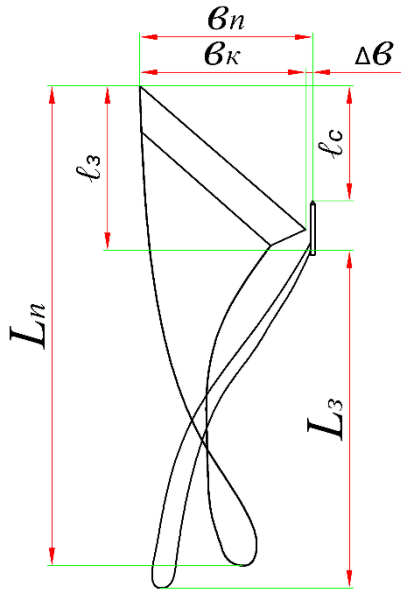


Fig. 1. Mutual arrangement of the hull and the backwash

The distance from the nose of the body to the nose of the strut ℓs after the formation is deformed must enter this zone and separate the overturning strata and prevent them from moving sideways. recommended ℓs = 10–20 см [5].

When plowing the aisles of gardens, we take: for a deep processing body $\ell_c^{ч}$=20 cm; for body surface (shallow) processing ℓ_c^{c}=10 см.

The distance from the nose of the body to the wing of the plow ℓz indicates the beginning of the impact of the plow on the side surface of the seam, lifted by the plow body (Fig. 2).

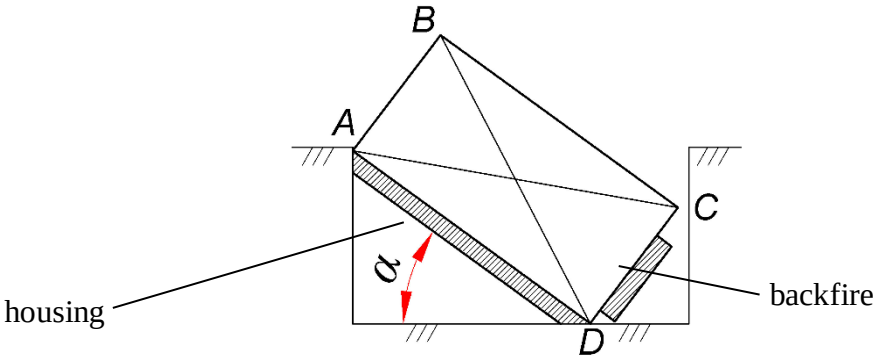


Fig. 2. Scheme for determining the location of the backer

As soon as the edge A of the seam rises to the level of the field, the plowman should begin to move the reference edge of the seam D towards the plow body.

Therefore, the distance ℓз can be determined by the following proportion

$$L_n \rightarrow \pi$$

$$\ell_з \rightarrow \text{arctga}/в$$

In this case $$\ell_з = \frac{L_n \cdot arctg\frac{a_n}{в_n}}{\pi} \qquad (1.1)$$

$$\ell_з = \frac{120 \cdot arctg\frac{15}{50}}{3.14} = 11.2см \approx 12см$$

Using the resulting expression, we define the following:

- for shallow plowing body and zapolzer

-for the body of deep plowing and plowing

$$\ell_з^{ч} = \frac{144 \cdot arctg\frac{30}{55}}{3.14} = 22.9см \approx 23см\,.$$

This means that the plow should be at a distance of 11.2-22.9 cm from the muzzle of the hull.

The length of the reservoir is determined from the condition of the beginning of the process of its impact on the formation, i.e. from the distance ℓз to the moment of turning the seam by 160 °. The reservoir must maintain its impact for a certain period of time after the hull is no longer acting on the formation.

When the formation with the length $L_{\text{p}}^{/}$ rotates by 180 °, then by 160 ° it rotates a distance. $L_{\text{n}}^{/}$ this case, it is defined as

$$L_{\text{n}}^{/} = \frac{L_n \cdot 1600}{180^0} = \frac{8}{9} L_n$$

Using the obtained expression, the length of the seam turn after the end of the impact of the reservoir on the seam is determined as follows:

- for shallow tillage body and zapadnik

$$L_{\text{n}}^{/} = \frac{L_n \cdot 1600}{180^0} = \frac{8}{9} \cdot 120 = 106{,}66 см \approx 107 см$$

- for deep processing body and zapluzhny

$$L_{\text{n}}^{/} = \frac{L_n \cdot 1600}{180^0} = \frac{8}{9} \cdot 144 = 127{,}99 см \approx 128 см .$$

In this case, the length of the stopper is determined as follows

$$L_з = L_{\text{n}}^{/} - \ell_з .$$

For shallow tillage hull and backfill

$$L_з^c = 107 - 12 = 95 см .$$

For deep working hull and backfill

$$L_з^ч = 128 - 23 = 105 см .$$

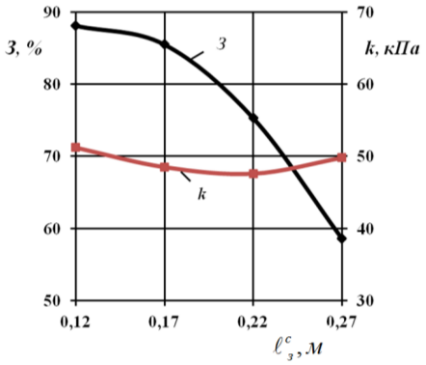
The position of the coulter relative to the body is determined by the distance ℓc from the nose of the body to the nose of the strut (Fig. 1) and the distance ℓз from the nose of the body to the wing of the coulter. Distance ℓ_3 was set equal to ℓ_c^c = 0,10 м and $\ell_c^ч$ = 0,20 м. The distance ℓ_3 changes by moving the excavator along the longitudinal plate of the handle.

The location indicators of the plow body for shallow plowing are shown in Fig. 3, a and for a deep plowing body are shown in Fig. 3, b.

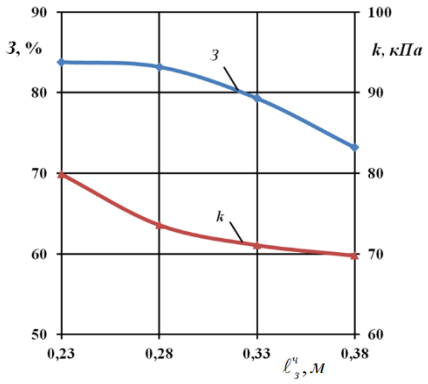
As can be seen from Fig. 3, the longitudinal distance ℓz from the body to the wing of the plug has a significant effect on the process of overturning the seam into its own furrow.

With the distance of the back-cover from the body leads to a decrease in both the degree of cover (embedding) and the reduced soil resistance.

If in a shallow plowing enclosure the degree of cover decreases from $з = 88{,}1\%$ at $\ell_з^c = 0{,}12\,м$ before $з = 85{,}5\%$, т.е. on the 2,6%**,** then at $\ell_з^c = 0{,}17\,м$ decreases to, i.e. another 10.2%. When $\ell_з^c = 0{,}12 - 0{,}17\,м$ there is a harmonic, i.e. rational, impact of the stopper and the body on the formation, and in the case $\ell_з^c > 0{,}17\,м$ there is a delay in the impact of the stopper.



а) $a = 0{,}15\,м; v = 1{,}1\,м/с$



б) $в = 0{,}30\,м; v = 1{,}1\,м/с$

Fig. 3. Influence of the distance from the nose of the body to the wing of the plow on the level of cover of colored blocks (3) and on soil resistance (k)

The resistance of the soil reduced to the body also decreases from $k = 51{,}2\,кПа$ at $\ell_з^c = 0.12\,м$, before $k = 48{,}5\,кПА$ at $\ell_з^c = 0.17\,м$ and before $k = 47{,}6\,кПА$ at $\ell_з^c = 0.22\,м$. This is due to the reduction in formation compression between the casing and the stopper. Then it increases to due to the destruction and accumulation of the soil layer.

Therefore, education is desirable $\ell_з^c = 0.12...0{,}17\,м$ for plow body shallow plowing.

These laws were also observed on the deep plowing body, but the influence $\ell_з$ was less.

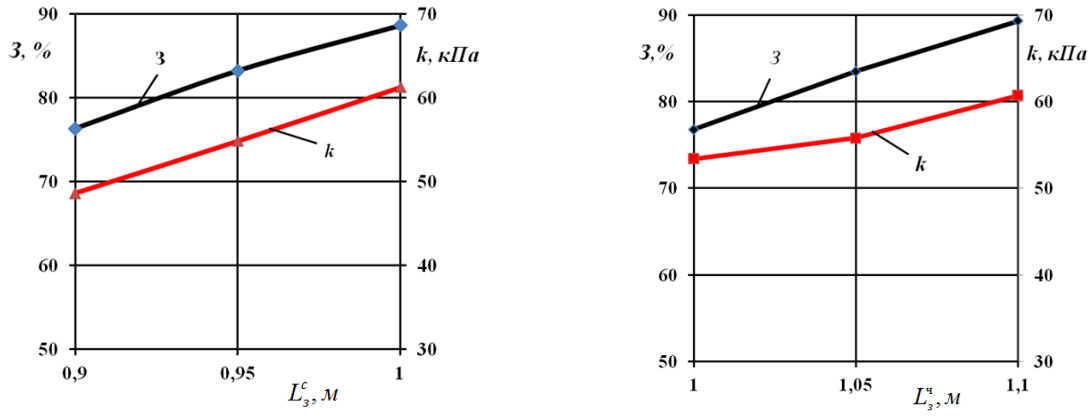
Rational value $\ell_з^ч$ made up $\ell_з^ч = 0{,}28...0{,}33 см$. When $\ell_з^ч = 0{,}23 см$ magnitude $з$ made up $з = 83{,}8\%$, and at $\ell_з^ч = 0{,}28 м$ $з = 83{,}2\%$, but k declined from $k = 79{,}9 кПа$ до $k = 71{,}1 кПА$. This is due to a decrease in the compression of the formation between the casing and the stopper.

Therefore, for deep plowing bodies there should be $\ell_з^ч = 0{,}28...0{,}33 см$.

Therefore, for deep plowing bodies there should be $L_з^с = 0{,}95 м$ and for deep plowing body $L_з^ч = 1{,}05 м$, from the condition that the stopper acts on the layer turned over by the body until the layer turns towards the body by 160 °.

In experimental studies, the length of the plow was studied according to the values $L_з^с = 0{,}90;\ 0{,}95;\ 1{,}0 м$ for shallow plowing and $L_з^ч = 1{,}0;\ 1{,}05;\ 1{,}10 м$ for a deep plowing body (fig. 4).

The influence of the plow has the same regularity in both cases, that is, with an increase in the length of the plow, the speed of the cover (3) and reduced soil resistance (k) increase. Increasing the impact of the reservoir on the seam improves the formation of the seam in its own furrow. Therefore, the degree of cover (3) increases. At the same time, an increase leads to an increase in friction forces and, consequently, to an increase in the reduced soil resistance.



а) $а = 0{,}15 м; v = 1{,}1 м/с$ *б)* $в = 0{,}30 м; v = 1{,}1 м/с$

Fig. 4. Influence of the length of the plow on the degree of cover (3) and reduced soil resistance (k)

Based on theoretical studies and from the condition of ensuring the degree of shelter $з > 80\%$, accept $\ell_з^с = 0{,}95 м$, $\ell_з^ч = 1{,}05 м$.

Under laboratory conditions, plant roots in the soil layer are absent, the soil density is not high, the degree of cover is relatively low, due to the rapid fragmentation of the layer in the process of overturning. In real field conditions, a high degree of cover is provided due to the above reasons.

Conclusion

In order to reduce the metal and energy consumption when laying the seam into its own furrow with a turn of 180^0, and to ensure the impact of the hull before the seam turns by 1500 and the plug up to 160^0, the length of the bodies for deep plowing bodies should be $L_к^c = 1{,}20м$. The length of the plugs should accordingly be $L_з^c = 0{,}95м;\ \ L_з^ч = 1{,}05м.$

The distance from the nose of the body to the wing of the harrow $\ell з$ should be set at a distance of 12 cm for the body of shallow plowing and the harrow, and at a distance of 23 cm for the body of deep plowing and the harrow.

For shallow plowing body the distance $\ell_з^c = 0.12...0{,}17м$ and for deep plowing body $\ell_з^ч = 0{,}28...0{,}33см$.

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