Justification of the parameters of the blade working body of the plowshare that forms a longitudinal bollard among the rows of cotton

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A.N. Murtazoev[1] and S.U. Shodiyeva[2]
[1] Bukhara State University, Bukhara, Uzbekistan
[2] Bukhara branch of TIIAME, Bukhara, Uzbekistan
E-mail: *azizbek.murtazoyev@mail.ru, sitorashodiyeva95@gmail.com*

Abstract. In this article the coverage width of justification of the parameters of the blade working of the plowshare that forms a longitudinal bollard among the rows of cotton, the results of the theoretical research conducted on the determination of the depth of immersion in the soil, the direction of movement and the angle of installation relative to the bottom of the rut are presented. It is noted that In the process of work, the working body of the device with the agitator should have a coverage width of 26,1 CM, the depth of immersion in the soil is 14,8 CM, so that it can form a threshold with the maximum height without damaging the sprouts and their roots, the direction of movement and the mounting angles relative to the bottom of the rut should be between at least 55º and 27-29º respectively.

Keywords: device, among the rows of cotton, longitudinal threshold, the working body of the wiper, plowshare, the width of the coverage, the depth of immersion in the soil, the direction of movement and the mounting angles relative to the bottom of the rut.

1. Introduction. It is known that [1-3] in the saline areas of Bukhara, Navai, Kharezm regions of our Republic and the Republic of Karakalpakstan before the first irrigation of the cotton, longitudinal and transverse planks are obtained in the pike, they are separated into pieces and during the whole vegetation the cotton is watered by pressing (filling) these pieces into the water. Watering the cotton in this method has the following advantages: firstly, the removal of harmful salts from the soil to the surface of the field and their negative impact on the development of the cotton germination is eliminated; secondly, complete and uniform irrigation of the area is provided, the wastage of water is reduced, and the work productivity of farmers increases.

At present, the separation of the growing areas of the cotton into pieces with longitudinal and transverse upholstery is carried out mainly by hand Force. In this case an average of 400 meters of longitudinal and transverse upholstery per hectare, of which 60-75 percent are longitudinal upholstery. Depending on the slope and level of leveling, longitudinal planks are obtained in the range from 10 m to 50 m, and transverse planks - _ _ m in length. In order to form longitudinal and transverse floors, heavy manual labor is spent on the account of 7-10 people per hectare.

Proceeding from the highlighted, a device with a working body with a wiper was developed to form a longitudinal threshold between the rows of buds (Figure 1, a). The device is used to hang on the chop tractor and is equipped with a hanging device frame 1, the operating body of the grinder installed in it is composed of 2, the protective sleeve 3 and the barrier 4.(san)

The longitudinal threshold is formed as a result of the passage of two times between the dependent parties, that is, between the ranges of the porous device. In this case fits onto the middle

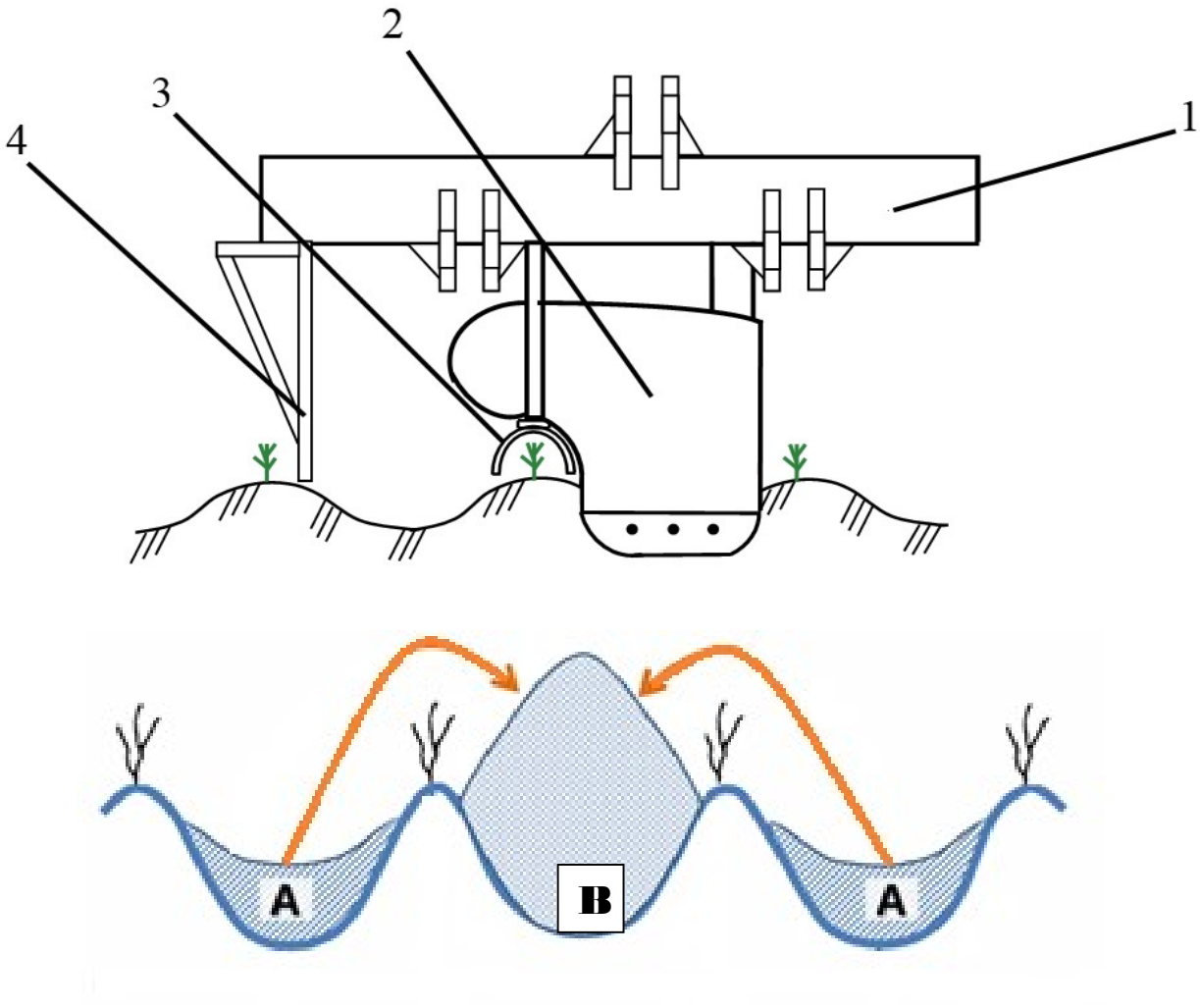
furrow by digging the soil out of the two adjacent furrows without causing injury to the grasses of the device's wobbling working body (1, B-picture).

In this article, the results of theoretical research on the determination of the parameters of the device body plowshare, which was developed to form a threshold between the rows of cotton, are presented.

2. Materials and methods of research.

Theoretical studies on the determination of the parameters of the device of the working body plowshare, which was developed to form a longitudinal threshold between the rows of cotton, were carried out using the theory of the wedge and the laws and regulations of peasant mechanics.

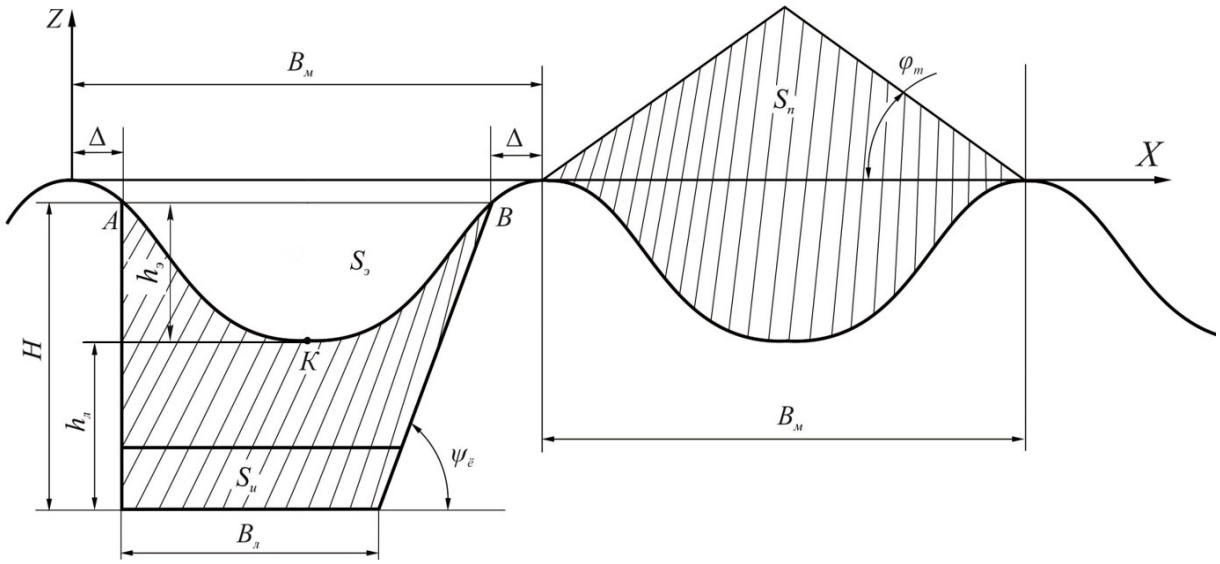
Results of the study and their discussion. In the studies, the width of the coverage, depth of immersion in the soil, the direction of movement and the mounting angles relative to the bottom of the rut were studied.



Picture 1. Schemes of the developed device (A) and the formation of a threshold by it (B)

The device is designed so that the working body with the agitator plowshare has a depth of immersion in the soil HL (relative to the middle of the rut) and the width of the coverage VL (Figure 2) the working body can form a threshold with the maximum height in the process of work and it was determined from the conditions that there is no causes for damages to the cornflowers and their roots.

According to the scheme presented in the picture 2, the working body consists of cornflowers of cotton and



Picture 2. Scheme for determining the depth of immersion in the soil and the width of coverage of the sedimentary working body plowshare.

in order for them to form a floor with a maximum value in height without damaging the roots, the following conditions must be met:

$$S_и = \frac{1}{2} S_n \tag{1}$$

And

$$B_л + Hctg\psi_ё = B_м - 2\Delta, \tag{2}$$

In this case $S_и$ – the surface of the cross-section of the soil, м^2; drilled in the body of the work with the agitator from the inside of the rut;

S_n – the surface of the cross-section of the floor at the maximum height, which is formed by the working body in the saddle of the army, м^2;

$B_л$ – coverage width of the working body plowshare, m;

H – layer of soil drilled by the working body maximum height, m;

$\psi_ё$ – slope fracture angle of the soil, degree;

$B_м$ – width between rows of cotton, m;

Δ – the width of the protection zone of the cotton rows, m.

According to the scheme presented in the picture 2

$$S_и = \frac{B_л + B_м - 2\Delta}{2} H - S_э, \tag{3}$$

So, $S_э$ – ABK the surface of the rut, м^2;

Cross-profile between rows of cells $Z = 0{,}5h_э\left(\cos\frac{2\pi X}{B_м} - 1\right)$

(So, Z and X – coordinate arrows, which are perpendicular to the top of the cotton row, respectively, and cross-oriented to it (the number of the goose), m; $h_э$ – the depth of the rut between the rows of the cotton, M) are considered to change according to the law, divided into $S_э$ with the following expression to determine

$$S_э = \left|\frac{h_э}{2}\int_{\Delta}^{B_м-\Delta}\left(\cos\frac{2\pi X}{B_м} - 1\right)dx\right| = \left|\frac{h_э}{2}\left(\frac{B_м}{2\pi}\sin\frac{2\pi X}{B_м} - X\right)\right|_{\Delta}^{B_м-2\Delta} =$$

$$= \left|\frac{h_э}{2}\left[-\frac{B_м}{\pi}\sin\frac{2\pi\Delta}{B_м} - \left(B_м - 2\Delta\right)\right]\right| = \frac{h_э}{2}\left[\frac{B_м}{\pi}\sin\frac{2\pi\Delta}{B_м} + \left(B_м - 2\Delta\right)\right]. \quad (4)$$

Now (3) we determine the H in the expression, that is, the maximum height of the soil layer, which is drilled by the working body. To do this, we will have the following from the picture 2

$$H = \left(B_м - 2\Delta - B_л\right)tg\psi_ё. \quad (5)$$

If we put $S_э$ and H (4) and (5) their values in terms of expressions (3), then the following Origin

$$S_и = \frac{B_л + B_м + 2\Delta}{2}\cdot\left(B_м - 2\Delta - B_л\right)tg\psi_ё - \frac{h_э}{2}\left[\frac{B_м}{\pi}\sin\frac{2\pi\Delta}{B_м} + \left(B_м - 2\Delta\right)\right]. \quad (6)$$

We bring this expression to the following view

$$S_и = \frac{\left(B_м - 2\Delta\right)^2 - B_л^2}{2}tg\psi_ё - \frac{h_э}{2}\left[\frac{B_м}{\pi}\sin\frac{2\pi\Delta}{B_м} + \left(B_м - 2\Delta\right)\right], \quad (7)$$

Praise by putting this value of $S_и$'s (1) expression $S_п = \frac{B_м}{2}\left(\frac{B_м}{2}tg\varphi_m + h_э\right)$

taking into account that ([in this case, φ_m – is the natural slope angle of the soil, degree Thistle)[4], we get the following result

$$2\left[\left(B_м - 2\Delta\right)^2 - B_л^2\right]tg\psi_ё - 2h_э\left[\frac{B_м}{\pi}\sin\frac{2\pi\Delta}{B_м} + \left(B_м - 2\Delta\right)\right] = B_м\left(\frac{B_м}{2}tg\varphi_m + h_э\right). \quad (8)$$

We bring this expression to the following view

$$\left(B_м - 2\Delta\right)^2 - B_л^2 = \left\{0{,}5B_м\left(\frac{B_м}{2}tg\varphi_m + h_э\right) + h_э\left[\frac{B_м}{\pi}\sin\frac{2\pi\Delta}{B_м} + \left(B_м - 2\Delta\right)\right]\right\}ctg\psi_ё. \quad (9)$$

To determine the Вл from this, we will have the following expression

$$B_л = \left\{ \left(B_м - 2\Delta\right)^2 - \left\{ 0{,}5B_м\left(\frac{B_м}{2}tg\varphi_т + h_э\right) + \right.\right.$$

$$\left.\left. + h_э\left[\frac{B_м}{\pi}\sin\frac{2\pi\Delta}{B_м} + \left(B_м - 2\Delta\right)\right]\right\} ctg\psi_ё \right\}^{\frac{1}{2}}. \quad (10)$$

As can be seen from this expression, the width of the coverage of the plowshare of the working body depends on the width of the rows of pores and the width of the protective zone between them, the depth of the roughness between them, as well as on the physic-mechanical properties of the soil.

To determine the depth of immersion of the working body plowshare in the soil in relation to the bottom of the rut, using the scheme presented in Figure 2, we can define the height *H* as follows

$$H = h_э + h_л - \left|Z(\Delta)\right| = h_э + h_л - \left|\frac{h_э}{2}\left(\cos\frac{2\pi\Delta}{B_м} - 1\right)\right| \quad (11)$$

or

$$H = h_л + \frac{h_э}{2}\left(1 + \cos\frac{2\pi\Delta}{B_м}\right). \quad (12)$$

(5) and (12) we solve the obtained expression in relation to $h_л$ by equating the right sides of the expression to each other

$$h_л = \left(B_м - 2\Delta - B_л\right)tg\psi_ё - \frac{1}{2}h_э\left(1 + \cos\frac{2\pi\Delta}{B_м}\right). \quad (13)$$

This expression (10) takes into account the expression as follows

$$h_л = \left\{ B_м - 2\Delta - \left\{ \left(B_м - 2\Delta\right)^2 - \left\{ 0{,}5B_м\left(\frac{B_м}{2}tg\varphi_т + h_э\right) + \right.\right.\right.$$

$$\left.\left.\left. + h_э\left[\frac{B_м}{\pi}\sin\frac{2\pi\Delta}{B_м} + \left(B_м - 2\Delta\right)\right]\right\} ctg\psi_ё \right\}^{\frac{1}{2}} tg\psi_ё - \frac{h_э}{2}\left(1 + \cos\frac{2\pi\Delta}{B_м}\right)\right\}. \quad (14)$$

This expression indicates that the depth of immersion in the soil of the working body plowshare also depends on the width of the porous rows and their protective zones, on the depth of the roughness between them, that is, between the porous rows, as well as on the physic-mechanical properties of the soil.

The angle of installation relative to the direction of movement (rut wall) of the agglutinative working organ plowshare was also determined from the condition that γ did not damage the cotton and their roots, and was divided into the following:

$$\gamma > 90° - \varphi_1, \tag{15}$$

In this case φ_1 – friction on the working surface of the soil wiper working body angle.

(15) When the condition is fulfilled, the plowshare of the working body Burrows the furrow soil between the rows of gauze without moving it to the side, that is, it works like a two-sided flat wedge. As a result, it is not damaged by plowshare by the germination and their roots.

The angle α of installation of the slab and of the working body plowshare is determined by the following expression, provided that the quality of the slab of the soil is high and its tensile resistance is relatively low [4]

$$\alpha_л = \arcsin\left\{\frac{-\sin(\varphi_1+\varphi_2)+\sqrt{\sin^2(\varphi_1+\varphi_2)+\left[2+\frac{1}{2}\cos(\varphi_1+\varphi_2)\right]\left[1+\cos(\varphi_1+\varphi_2)\right]}}{\left[2+\frac{1}{2}\cos(\varphi_1+\varphi_2)\right]}\right\}, \tag{16}$$

So φ_2 – the angle of friction of the soil to the soil.

Δ = 0,1 м, φ_m = 35-40°, $h_э$ = 0,1 м, φ_1=28-31°, φ_2=38-40° [5-7], $\psi_ё$ = 60°

by accepting, (10), (14), (15) and (16) the calculations made on the expressions showed that the width of the plowshare of the working body for the rows of porcupines with a width of 60 cm was 26,1 CM, its depth of immersion in the soil was 14,8 CM, the direction of movement and the mounting angles in relation to the bottom of the furrow should be

3. Conclusion.

According to The conducted studies, in order for the device developed to form a longitudinal threshold between the rows of cotton in the process of operation to form a threshold with a maximum height of 26,1 CM, without causing damage to the roots of the porcine, the coverage width of its plowshare should be within the range of 14,8 CM, the depth

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