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Determination of the Parameters of the Deep Softening Working Body and Softening Depth

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Abstract. In order to increase the productivity of cotton, it is necessary to treat the soil between cotton rows with good quality. In recent years, a new technology has entered the tillage technology, that is, deep softening between cotton rows. The deep softener unit resulted in increased time and fuel consumption as the cotton was separated between the rows. To reduce costs, the inter-row cotton cultivator has been improved, and a cotton inter-row and deep-tilling cultivator has been created at the same time. This scientific article deals with the issue of justifying the parameters of the working bodies of the deep softener.

Keywords. Resource efficient, advanced technology, improved cultivator-deep softener, aggregate, rounded construction, working depth, cotton row spacing, deep-softener, protection width,

Tillage is important in increasing crop productivity. Therefore, in recent years, much importance has been attached to high-quality soil treatment, application of advanced technologies, special attention to resource saving during treatment. The importance of the above activities is based on the production of high-performance combined agricultural machines, and this issue has become one of the urgent issues of the present time. Therefore, in order to increase the yield of cotton, in order to increase the productivity of cotton, instead of performing the deep loosening process with a separate aggregate, in order to save resources, install a deep loosening work body on the currently working cultivator, and use the cultivator as a deep softener. improvement and production of the option of installing it on the suspension mechanism of the tractor, increasing the yield of cotton and ensuring energy saving was taken as an important goal.

Cultivators working between the rows, the operation of their working bodies and the justification of their parameters, the determination of the quality of soil cultivation and traction resistance based on theoretical studies have been studied by scientists of foreign countries and our Republic. The theoretical expressions and recommendations obtained by them are still being used.

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However, until now, work has not been carried out on the integrated construction of the cultivator, which should be installed on the tractor chain with the help of a suspension mechanism.

Based on the purpose of the research, an improved design of the cultivator working between the rows of cotton was developed, that is, a rounded design attached to the tractor in a suspended form. The improved design not only works between the cotton rows, but also performs the deep-softening process, which works according to the deep-softening technology between the rows that has come into practice, so it is called the construction of the cultivator-deep softener. [1]

In order for the quality of the works performed by the newly developed cultivator-deep softener to meet the agrotechnical requirements, the parameters of the working bodies should be selected correctly. The cultivator-deep softener's softening, irrigation ditch receiving, fertilizing work bodies have been sufficiently studied by researchers. The operation of the deep softener installed in their row between the cotton rows has not been studied to date. In order for the deep softener to work effectively, its parameters must be determined taking into account the working conditions between the rows of cotton.

The parameters of the deep softener are as follows:

- the angle of installation of the working body relative to the surface of the softened bottom of the soil - **α**
- the width of the working body – **b;**
- the length of the working body –**l;**
- in addition to these, processing depth - **h;**

During the movement of the deep softener, the soil is deformed. It has been determined on the basis of research that it depends on the shape and parameters of the working body, the depth of processing and the physical and mechanical properties of the soil. Deformation occurs when the soil shifts or crumbles. We present the general scheme, which is the basis for determining the parameters of the deep softener, Picture. 1.

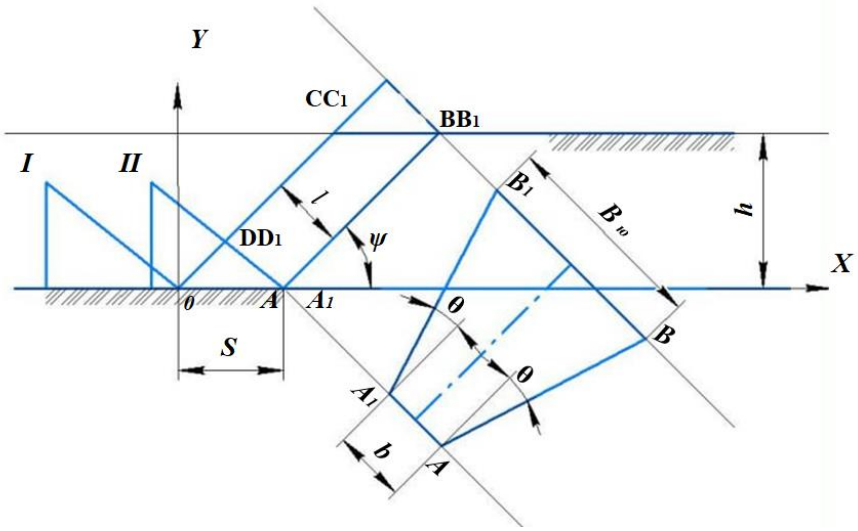

Figure 1. Deformation of the soil under the influence of the working body of the deep softener.

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When the working body moves from state I to state II to a distance S, the soil is deformed and the resulting stress reaches the limit value, and the soil breaks or breaks at an angle ψ in the direction of movement. The refraction angle of the soil has the following form in terms of displacement [2,3].

$$\psi = \frac{\pi - (\alpha + \varphi_1 + \varphi_2)}{2}, \quad 1.$$

φ_1, φ_2 - angle of external and internal friction of the soil, degrees.

$\varphi_1 - 30^0, \varphi_2 - 40^0$ accepted.

α- angle of penetration of the working body of the deep softener into the soil, degrees.

When soil is disintegrated by landslides S_c

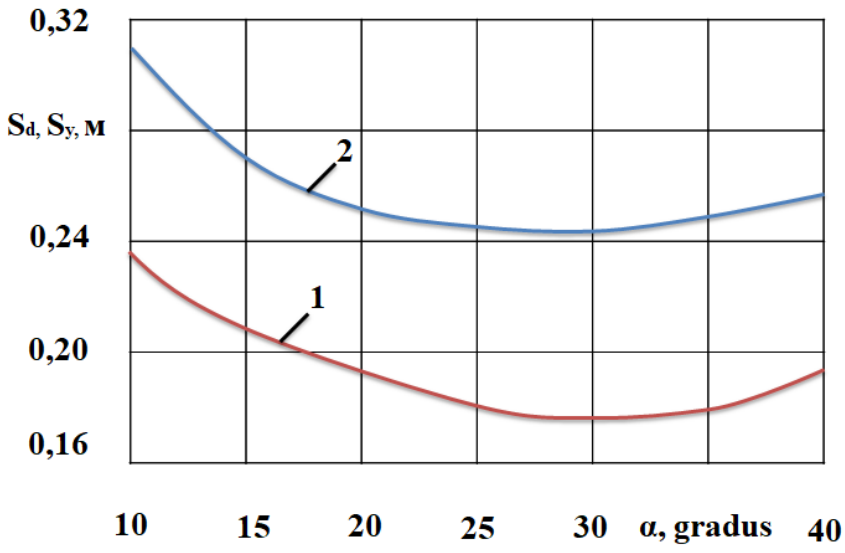
$$S_c = \sqrt{\frac{\tau_{np} \cdot (b + h + tg\psi) \cdot h \cos\frac{1}{2}(\varphi_1 + \varphi_2 - \alpha)}{q_0 \cdot b \cos\frac{1}{2}(\alpha + \varphi_1 + \varphi_2)[\cos(\alpha + \varphi_1) + \cos\varphi_2]}}, \quad 2.$$

In this:

τ_{np} - limit value of the test voltage, $2 \cdot 10^4$ Pa;

q_0 – coefficient of volume compression of the soil, 10^7 N/m^2;

Expression *h=0,5 m, b=0,1 m, ψ=30⁰, α=10⁰, 15⁰, 20⁰, 25⁰, 30⁰, 35⁰,* ва *40⁰* putting the accepted values and solving the expression (2) graphically with respect to *α*, we will be able to choose the value of the installation angle α of the working body of the deep softener, Picture. 2.



1- by displacement; 2- on interruption.

Picture 2. The change of the displacement distance of the working body by the angle α.

It was found that the displacement distance when the working body is pushed to break the soil is relatively small. The shortness of the displacement distance corresponds to the value of the installation angle of the working body equal to $\alpha=30^0$ in both cases. For the following

calculations, we assume that $\alpha=30^0$.

Determination of the length of the working body of the deep softener. We determine the length of the working body using Picture 1. One side of the triangle AOD, that is, side AD, is the length of the working body *l*. The condition is that $l \geq AD$ AD so that the thrust of the soil layer is not disturbed. [9] Since $\angle O=\psi$, $\angle A=\alpha$ and $\angle D=[180-(\alpha+\psi)]$ of the triangle AOD, we determine the length *l* using the theorem of sines, i.e.

$$\frac{l}{\sin\psi} \geq \frac{S_c}{\sin\left[180-\left(\alpha+\psi\right)\right]}, \quad 3.$$

After some modifications we have the following.

$$l \geq \frac{S_c \cdot \cos\frac{1}{2}\left(\alpha+\varphi_1+\varphi_2\right)}{\cos\frac{1}{2}\left[\alpha-\left(\varphi_1+\varphi_2\right)\right]}, \quad 4.$$

If we put the value of S_s given in Figure 2 and the values accepted above into the obtained expression when $\alpha=30^0$, we determine that it is equal to $l \geq 0.123$ m. So the length of the working body should not be less than 0.123 m.

The specified parameters α and *l* are determined using the methods used above, regardless of whether the deep softener works on a flat field or between rows of cotton.

Determination of the width b of the working body of the deep softener and the depth of softening. Deep loosening between cotton rows, under cotton growing conditions, differs in many respects from loosening in bare areas. [10] The width of the working body of the deep softener and the processing depth are determined by taking into account the width of the rows of cotton, the location of the cotton roots and the protective widths marked on them, Picture. 3.

In recent years, cotton is based on the technology of deepening the rows between the rows, when the rows are 0.90 m, the limit depth is in the range of *h=35...40 cm*, when the rows are *0.76...0.80 m*, *h=0.30...0.35 m*, the row spacing was set at *0.60 m* to *h=0.30* m and this is used in practice. The boundary depth is determined relative to the surface of the cotton planted area. [11]

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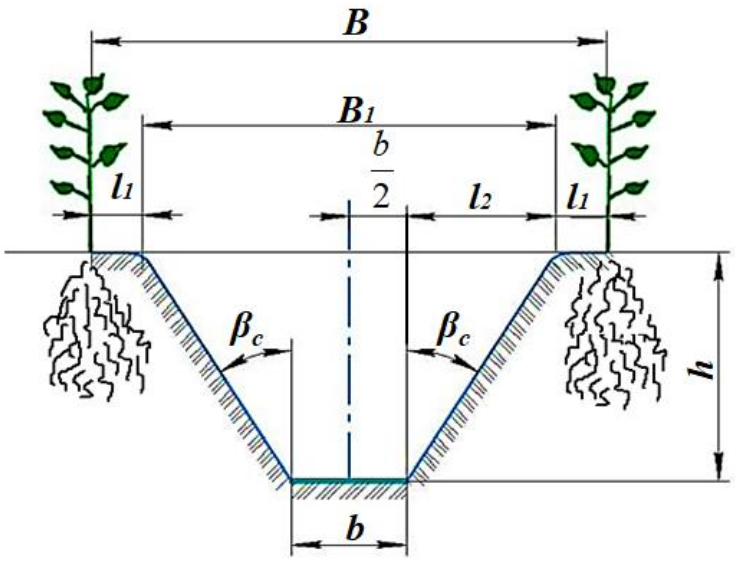


B-width between rows of cotton; B_1-width to be softened; l_1-protection width; b-the width of the working body; β-the angle of refraction of the transverse boundary of softened soil, degrees.

Picture 3. The form of deep softening between rows of cotton and its dimensions.

According to the above scheme, the upper width B_1, which can be softened between cotton rows, is equal to the following;

$$B_1 = B - 2l_1, \qquad 5.$$

Taking into account the parameters of the deep softener b and the processing depth h, the softening width B_1 is determined as follows.

$$B_1 = b - 2l_2, \qquad 6.$$

The distance at which the angle of refraction of softened soil corresponds to β_c l_2 is as follows;

$$l_2 = h \cdot tg\beta_c, \qquad 7.$$

Or

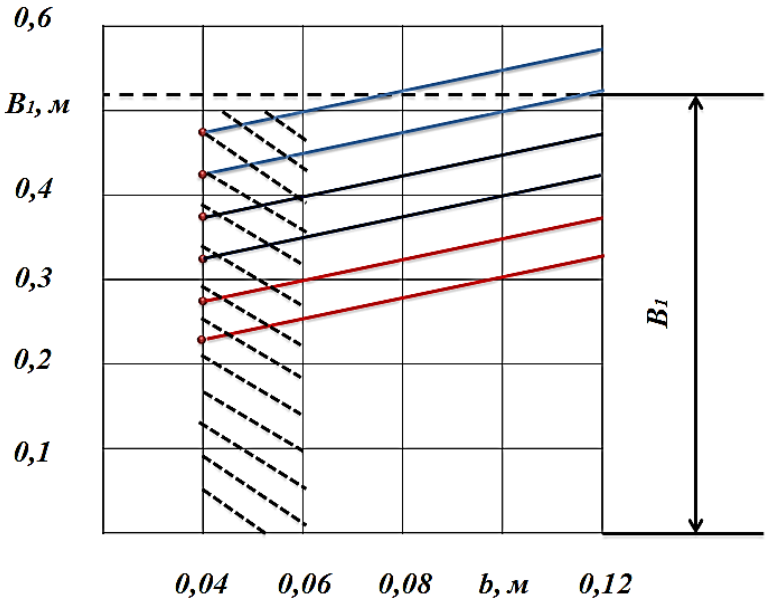
Most of the time $\beta_c = \Theta$ – Mor angle is also called [4]. In that case

$$\beta_c = \theta = \frac{\pi}{4} - \frac{\varphi}{2} = 30^0 \quad \text{will be equal to} \quad \varphi = 30^0 .$$

The width that can be softened, taking into account the working width and the working depth, is as follows;

$$B_1 = b + 2 \cdot h \cdot tg\beta_c, \qquad (8)$$

According to the processing width, the processing depth h=0.15 m, 0.20 m, 0.25 m, 0.30 m, 0.35 m, 0.40 m and the width of the working body b=0.04 m, 0 ,06 m, 0.08 m, 0.10 m, 0.12 m, were solved graphically by putting the values in expression (8), Picture. 4. This figure shows the case with cotton row spacing of 0.9 m. [12]



1. *h=0,15 m;* **2.** *h=0,20 m;* **3.** *h=0,25 m;* **4.** *h=0,30 m;* **5.** *h=0,35 m,* **6.** *h=0,40 m*

Picture 4. Select the width of the working body and the depth of processing according to the width of the processing between the rows.

As can be seen from the graphs, it was found that the deep tillage between the rows of cotton is fundamentally different compared to the flat fields or the width of the working bodies and the depth of tillage in loosening the bottom of the plow. It was found that the value of the softening depth between cotton rows should be less than h=0.35...0.40 m when the row spacing is 0.90 m, and the width of the working body should be in the range of b=0.04...0.06 m. [13]

Exceeding the value of this distance will have a negative effect on the roots of the cotton bushes located in the rows, causing a decrease in the cotton yield.

Summary.

1. T.S.Khudoyberdiyev., M.Sh.Kholdarov. Sectional cultivator for processing between rows-to develop a design of a deep softener. //International Academy of Theoretical & Applied Sciences 03 (107) 2022 Philadelphia, USA http://www.t-science.org/conf/2022/03-2022-4.pdf
2. Новиков, Ю.Ф. Некоторые вопросы теории деформирования и разрушения почвы под действием двухгранного клина / Ю.Ф. Новиков. - Труды ЧИМЕСХ, вып. 46. Челябинск, 1969. – с. 20-34.
3. Горячкин В.П. Собрание сочинений: в 3-х т. / Изд. 2-е. Под ред. Н.Д. Лучинский. Т. 1 - Москва. : Колос, 1968 - 730 с.

4. Гниломедов.В.П., Разбрасывание почвы лапами пропашного култиватора с изменением скорости движения // Известия Куйбышевского селскохозяйственного института. Том. 15. Куйбышевского книжное издателство, 1969. 20-32 стр.
5. Xudoyberdiev, T. S., Boltaboev, B. R., Razzakov, B. A., & Kholdarov, M. S. (2020). To the fertilizer knife determination of resistance. Asian Journal of Multidimensional Research (AJMR), 9(8), 65-71.
6. Холдаров, М. Ш. (2020). УНИВЕРСАЛЬНО-КОМБИНИРОВАННЫЙ КУЛЬТИВАТОР УЛУЧШЕННАЯ КОНСТРУКЦИЯ УДОБРЕНИЯ. INTERNATIONAL JOURNAL OF DISCOURSE ON INNOVATION, INTEGRATION AND EDUCATION, 1(5), 44-48.
7. Khudoyberdiev, T. S., Boltaboev, B. R., & Kholdarov, M. S. Improved Design of Universal-combined Cultivator-fertilizer. International Journal on Orange Technologies, 2(10), 83-85.
8. Худойбердиев Т. С. и др. НОВАЯ КОНСТРУКЦИЯ УНИВЕРСАЛЬНОГО КОМБИНИРОВАННОГО КУЛЬТИВАТОРА УДОБРИТЕЛЯ //Life Sciences and Agriculture. –2021. –No. 1 (5).https://cyberleninka.ru/article/n/novaya-konstruktsiya-universalnogo-kombinirovannogo-kultivatora-udobritelya
9. Khudoiberdiev T. S., ShNNurmatov B. R., Boltaboev M. NEW CONSTRUCTION OF THE UNIVERSAL COMBINED FERTILIZER CULTIVATOR //Life Sciences and Agriculture. –2021. https://scholar.google.com/scholar?hl=ru&as_sdt=0,5&cluster=17622309352357946512
10. Khudoyberdiev T. S., Tursunov B. N. M. Sh. Kholdarov, NorkulovKh. M, &Ganiev OO (2021). RESERVES FOR REDUCING FUEL AND ENERGY COSTS FOR CULTIVATION OF COTTON IN THE CONDITIONS OF THE REPUBLIC OF UZBEKISTAN. Innovative Technologica: Methodical Research Journal, 2 (05), 60–64.1
11. Khudoyberdiev, T. S., Tursunov, B. N., Abdumannopov, A. M., & Kholdarov, M. S. (2021). Improving Soil Softening Work Bodies Structures.// EFFLATOUNIA-Multidisciplinary Journal,5 (3). http://www.efflatounia.com/index.php/journal/article/view/576
12. Худойбердиев, Т. (2022). ТУПРОҚНИ ЮМШАТУВЧИ ИШЧИ ОРГАНЛАР КОНСТРУКЦИЯЛАРИНИ ТАКОМИЛЛАШТИРИШ. Архив научных исследований, 2 (1). извлечено от http://journal.tsue.uz/index.php/archive/article/view/1562
13. Худойбердиев, Т. С., & Холдаров, М. Ш. Ў. (2022). СПОСОБ РЕГУЛИРОВКИ РАБОЧИХ ОРГАНОВ ГЛУБОКОРЫХЛИТЕЛЯ КОМБИНИРОВАННОГО КУЛЬТИВАТОРА. *Universum: технические науки*, (5-3 (98)), 56-58. https://cyberleninka.ru/article/n/sposob-regulirovki-rabochih-organov-glubokoryhlitelya-kombinirovannogo-kultivatora/viewer