

COPY RIGHT



ELSEVIER
SSRN

2021 IJIEMR. Personal use of this material is permitted. Permission from IJIEMR must be obtained for all other uses, in any current or future media, including reprinting/republishing this material for advertising or promotional purposes, creating new collective works, for resale or redistribution to servers or lists, or reuse of any copyrighted component of this work in other works. No Reprint should be done to this paper, all copy right is authenticated to Paper Authors

IJIEMR Transactions, online available on 21th May 2021.

Link: <https://ijiemr.org/downloads/Volume-10/Issue-05>

DOI: 10.48047/IJIEMR/V10/I05/31

Title: **INVESTIGATION RESULTS CARRIED OUT ON THE BASE OF THE PARAMETERS OF THE COMBINED AGGREGATE FURROW MAKER**

Volume 10, Issue 05, Pages: 127-132

Paper Authors:

**Anvarjon Nazirjonovich Khudoyarov¹, Dilmurod Asadullayevich Abdullayev²
Matluba Ashuraliyevna Yuldasheva³, Dilshodbek Khudoynazarov Otabek o'g'li⁴**



USE THIS BARCODE TO ACCESS YOUR ONLINE PAPER

To Secure Your Paper As Per **UGC Guidelines** We Are Providing A Electronic Bar Code

INVESTIGATION RESULTS CARRIED OUT ON THE BASE OF THE PARAMETERS OF THE COMBINED AGGREGATE FURROW MAKER

Anvarjon Nazirjonovich Khudoyarov¹, Dilmurod Asadullayevich Abdullayev²
 Matluba Ashuraliyevna Yuldasheva³, Dilshodbek Khudoynazarov Otabek o'g'li⁴
Professor, Andijan agriculture and agro-technologies Institute¹
Assistant professor, Andijan agriculture and agro-technologies Institute²
Independent researchers, Andijan agriculture and agro-technologies Institute^{3,4}

Abstract: The fields freed from the cotton harvest by the technology directed to minimal soil processing in germinating cotton and the combined aggregate which accomplishes it are not plowed in autumn and the furrows of irrigated beds are softened and fertilized. In these softened and fertilized beds new beds are formed for sowing cotton seeds in the following year. This article is focused on the investigation results carried out on base of the parameters of combined aggregate furrow maker. Due to the gained result it was determined that when the width of the interspaces between rows are 90 cm the entrance corner of furrow makers in the soil must be 10.7-13.2 cm and the distance of settlement along the softener must be at least 0.578 m in order to make 26-30 cm high beds.

Keywords: Technology directed to minimal processing of the soil, combined aggregate, softener, furrow maker, bed interspaces, spherical disc forming a bed, crooked radius of the working surface of the disc, the depth of soil entrance of the furrow maker.

Introduction

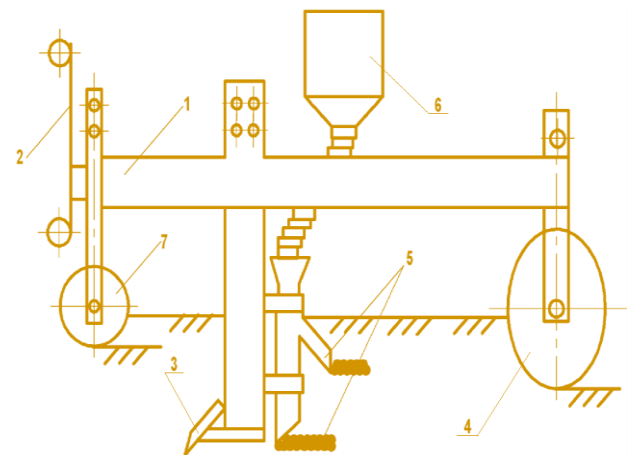
Since the world was created, our society is developing stage by stage. The present stage of the world's development is described as the century of developed techniques and technologies.

In every sphere of social life, in all branches of human activity, in germinating agricultural products, newly developed resource economizing technologies and the technical devices which accomplish it are being used due to the requirements of today.

On the basis of the analysis of certain literature and the carried research results [1], [2], [3] it was determined that the fields freed from the cotton harvest by the technology directed to minimal soil processing in germinating cotton and the combined aggregate which accomplishes it are not plowed in autumn and the furrows of irrigated beds are softened and fertilized. In these softened and fertilized beds new beds are formed for sowing cotton seeds in the following year.

Combined aggregate (picture 1) consists of the frame- 1, fixer for hanging the aggregate

on the tractor- 2, depth softener- 3, furrow maker- 4, fertilizer bunker- 5, fertilizer distributor- 6 and basic wheel- 7.

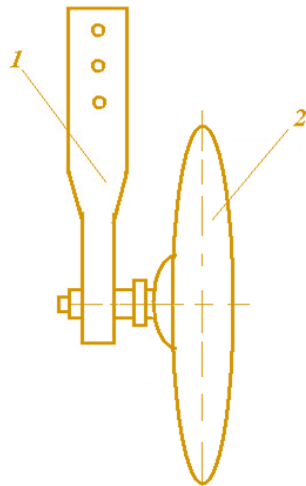


Picture 1. Combined aggregate directed to minimal soil processing.

Main working organs of the combined aggregate are: softener of the soil which does not plug the soil but softens, the device that fertilizes the softened layer in a ribbon shaped method and the furrow maker forming beds on the fertilized layer.

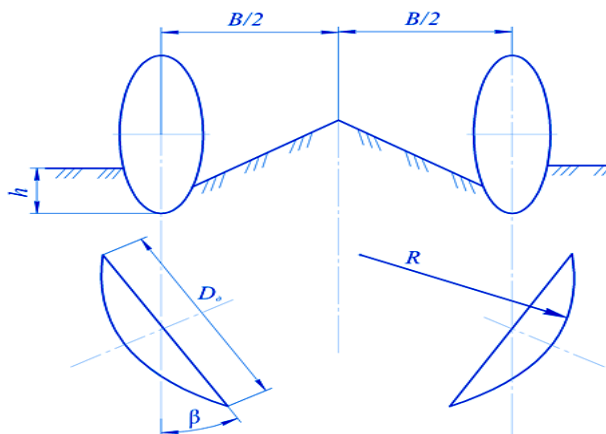
The furrow maker of the combined aggregate [4], [5] plugs the soil remained after the previous season on the layer softened by the deep softener and makes new beds. The analysis of the literature and the results of the carried comparative tests [6], [7], [8] point out that utilization of spherical discs as tillage of the combined aggregate for forming qualitative beds by spending little energy show good results.

The furrow maker of combined aggregate (picture 2) consist of the column and spherical disc and make beds in the result of moving the soil in beds remained from the previous year onto the fertilized layer softened by the softener and fertilized by the help of fertilizers. Here, every bed is formed by two discs placed opposite to each other (picture 3).



1- column; 2- spherical disc which forms a bed

Picture 2. The working organ of the furrow maker of combined aggregate



Picture 3. The scheme of forming a bed by the help of spherical discs

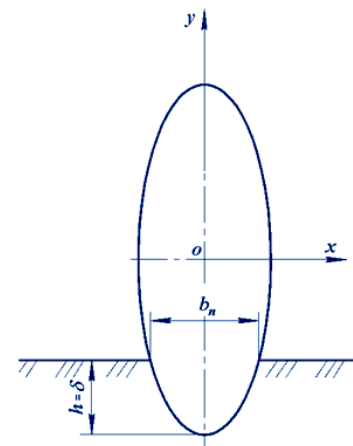
Main parameters of influencing the quality and energy working indices of the aggregate are tillage, crooked radius of the working surface of the disc- R , its diameter- D_d , the entrance corner relatively to the motion direction- β , the distance of settlement of the furrow maker to the softener - $L_{to,d}$.

The main criteria for choosing the favorable values of furrow maker is the supply of making beds on the softened and fertilized layer which answer the demands by spending minimal energy.

In the technologic process of furrow making the discs cut soil blocks, raises them along the working surfaces, throws aside and makes beds. Resulting from these mentioned we will investigate cutting the soil blocks by discs, movement of the blocks on the disc surface and the process of making beds. We will make all these resulting from the results of investigations carried out by G.N. Sineokov, F.M.Kanarev, A. Tukhtakuziyev, F.M.Mamatov, A.A. Nasritdinov, H.T. Kirgizov, S.P. Chirtsov, E.I.Ponomarev and others [6],[7],[8], [9],[10],[11],[12],[13].

Shape and sizes of the soil block cut by spherical disc.

We can see from picture 4 that the spherical disc cuts the soil blocks the horizontal cut of which is in the shape of a gutter.



Picture 4. The scheme determining

the shape and sizes of soil blocks cut by spherical disc

The part of soil blocks cut by disc knives are in the shape of ellipse and we can express it by the following equation:

$$\frac{y^2}{R_d^2} + \frac{x^2}{R_d^2 \sin^2 \beta} = 1, \quad (1)$$

Here, R_d – is the disc radius;

x, y – are the coordinate arrows inserted into the center of disc rotation.

The width of horizontal cut of the soil block is characterized with b_n , its thickness with δ and the surface with S . [17] They can be found by the following expressions:

$$b_n = \sqrt{h(D_d - h)}; \quad (2)$$

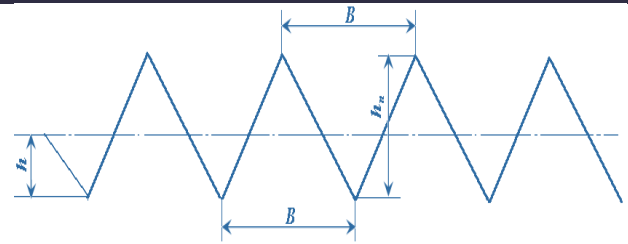
$$\delta = h; \quad (3)$$

$$S = \int_{R_d-h}^R x dy = 0,5 R_d^2 \left[\frac{\pi}{2} \arcsin \left(1 - \frac{h}{R_d} \right) - \left(1 - \frac{h}{R_d} \right) \right] \sqrt{1 - \left(1 - \frac{h}{R_d} \right)^2}, \quad (4)$$

Here, h – is the entrance depth of the spherical disc into the soil.

We can see from the following that, the shape and sizes of the soil block cut from the soil by the disc depend on the disc diameter(radius), settlement corner along the movement and the depth of soil entrance. [18]

Determination of bed height and the depth of furrow maker entrance into the soil. On the basis of the references given in the carried investigations we will identify the height of beds which are made [19] by furrow maker and the depth of their soil entrance by considering that lateral walls of beds are placed under the corner of natural fall of the soil (picture 5) relatively to horizontal flatness.



Picture 5. Scheme of identifying the bed height and the depth of soil entrance of the furrow maker

Due to the scheme given in picture 5:

$$h_n = 0,5 B \operatorname{tg} \varepsilon, \quad (5)$$

Here, h_n – is the bed height;

B – the distance between beds;

ε – corner of natural fall of the soil.

Thus, due to the expression (5) the bed height made the furrow maker depends on the distance between beds and the corner of natural fall of the soil.

We can witness that by putting certain values (30-40° [12,13]) of ε in the expression (5) we can make 26-30 cm high beds in 90 cm interspaces.

In order to determine the entrance corner of the furrow maker into the soil we use the following equation made on the basis of the scheme in picture 6.

$$h^2 \operatorname{tg} \varepsilon = k_{\text{ю.к}} (h_n - h)^2 \operatorname{tg} \varepsilon, \quad (6)$$

Here, h – is the depth of the soil entrance of furrow maker;

$k_{\text{ю.к}}$ – softening coefficient of the soil.

We will have the following expression by solving the expression (6) relatively to h .

$$h = \frac{h_n \sqrt{k_{ю.к}}}{1 + \sqrt{k_{ю.к}}} \quad (7)$$

By putting the value of h_n on agro technical demands, by receiving ($h_n=24\pm 3$) and $k_{ю.к} = 1.1$ [12,13] we will determine that the depth of soil entrance of the furrow maker is between 10.7-13.2 cm.

The settlement distance of the furrow maker in the round direction of the softener. If the round distance between the softener and tillage is not enough, the soil will enter into the interspaces and this will result in the resistance of pulling the aggregate and the destruction of a technologic process. [20] Having the distance more than that will result in the big size of the tool and increase of the metal size.

Due to the scheme given in picture 6, we can find the settlement distance of the furrow maker in the direction of the softener by the following expression

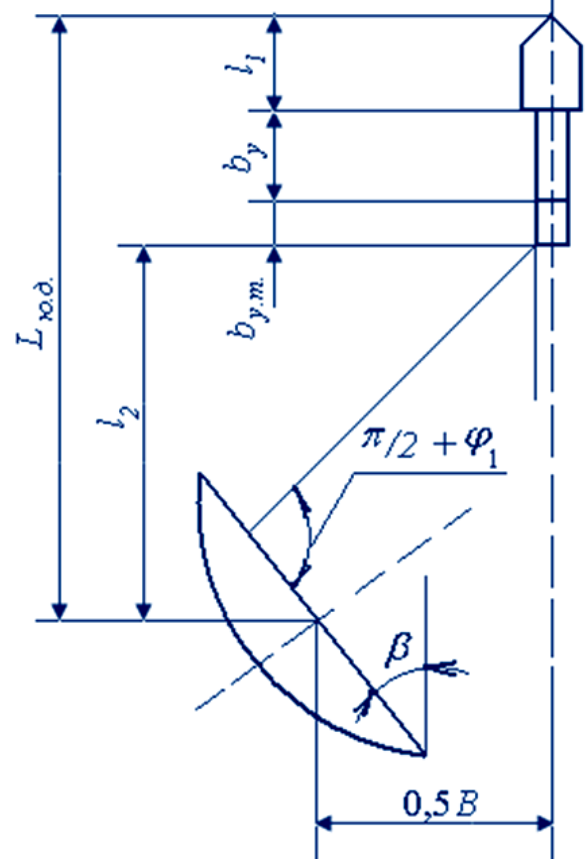
$$L_{ю.д.} \geq l_1 + l_2 + b_y + b_{y.m.}, \quad (8)$$

Here, l_1 - is the distance determining the of softener palm going out the frontiers relatively to the column i.e. [21] the softener fist;

l_2 - zone of the soil deformation spread in the round direction under the influence of the furrow maker;

b_y - width of the softener column;

$b_{y.m.}$ - width of fertilizer distributor.



Picture 6. The scheme of identifying the distance of furrow maker settlement in the direction of the softener

The palm fist of the softener is determined by the following expression

$$l_1 = L_{ю} \cos \alpha_{ю} \quad (9)$$

We will have the following by putting the value [14] of the working surface of the softener by putting it in the expression (9) of determining the length $L_{ю}$ of the working surface of the softener.

$$l_1 = 2 \left\{ \left[\tau_{\delta} \left[b_p \cos \frac{1}{2} (\alpha_p + \varphi_1 + \varphi_2) + \text{htg} \left(\frac{\pi - \varphi_2}{4} - \frac{\varphi_2}{2} \right) \right] \times \right. \right. \\ \times h \cos \frac{1}{2} (\varphi_1 + \varphi_2 - \alpha_p) \cos \varphi_1 \times m h^n (1 + K_r V) b_p \cos^2 \frac{1}{2} \times \\ \left. \left. \times (\alpha_p - (\varphi_1 + \varphi_2)) [\cos (\alpha_p + \varphi_1) + \cos \varphi_2] \sin \alpha_p - \right\}^{\frac{1}{2}} \cdot \cos \alpha_p \cdot \quad (10)$$

Due to the scheme given in picture 6:

$$l_2 = \sqrt{R_a - (R_a - h_a)^2} \cos \beta + \left\{ 0,5B - 0,5t_{\delta,\delta} + \left[R_a - \sqrt{R_a - (R_a - h_a)^2} \right] \sin \beta \right\} \operatorname{tg}(\beta + \varphi_1) \quad (11)$$

By considering (10) and (11) expressions the expression (8) will have the following form:

$$L_{p,a} = 2 \left[\frac{[\tau_s] \left[b_p \cos \frac{1}{2}(\alpha_p + \varphi_1 + \varphi_2) + \operatorname{tg} \left(\frac{\pi - \varphi_2}{4} \right) \right]}{q_0 (1 + K_V V) b_p \cos^2 \frac{1}{2}(\alpha_p - (\varphi_1 + \varphi_2))} \right] \times \left[\frac{h \cos \frac{1}{2}(\varphi_1 + \varphi_2 - \alpha_p) \cos \varphi_1}{[\cos(\alpha_p + \varphi_1) + \cos \varphi_2] \sin \alpha_p} \right]^{\frac{1}{2}} \cos \alpha_p + \sqrt{R_a - (R_a - h_a)^2} \cos \beta + \left\{ 0,5B - 0,5t_{\delta,\delta} - \left[R_a - \sqrt{R_a - (R_a - h_a)^2} \right] \sin \beta \right\} \operatorname{tg}(\beta + \varphi_1) + b_\delta + b_{\delta,\delta} \quad (12)$$

We can see from the analysis of this expression that the distance between a softener and tillage depend on their parameters and physical-mechanical features of the soil.

By receiving the given values of (12) $[\tau_s]$, φ_1 , φ_2 , m, n , α_{10} , h , b and K_V [14] and $R_0 = 0,275M$, $h_0 = 0,15 M$, $R = 0,6 M$ [15], [16] the calculations of the aggregate speed as 2,0 m/h show that the round distance between the softener and the furrow amker must be at least 0.578 m.

Conclusion. 1. Due to the carried investigations we were able to get analytical connections that give the opportunity to determine the sizes of soil blocks cut by a spherical disc, the bed height made by it and the depth of its entrance into the soil.

2. The shape and sizes of the soil block cut by the tillage in the shape of a spherical disc depend on its diameter (radius), settlement corner relatively to the movement direction and the depth of soil entrance.

3. When the width of the interspaces between rows are 90 cm, the entrance corner of

furrow maker in the soil must be 10.7-13.2 cm and the distance of settlement along the softener must be at least 0.578 m in order to make 26-30 cm high beds.

Literature:

1. Khudayarov A.N. new method of processing the soil and technical device of accomplishing it // ToshDTU NEWS- T., 2007. – №4. –p.59-64.

2.A.N.Khudayarov, M.Mamadaliyev, M.Yuldasheva, R.Muradov Power-efficient method of tillage and its technology model //European science review Austria, Vienna January-February. №1-2, 2017 212-214

3.Khudayarov A.N. Combined aggregate for minimal processing // Techniques in agriculture. Moscow, –2009. – №6. –p.56-57.

4.Khudayarov A.N. comparative testing results of the combined aggregate tillage / effective utilization of new and foreign techniques and technologies in agriculture in soil-climatic conditions of Fergana valley: epublican scientific-technical conference. Andijan, 2009. –p.147-150.

5.A.N. Khudayarov, I. A. Nazirjonov, M.A.Yuldasheva, R.X. Muradov. Researches carried on determination of the tillage diameter and settlement corner// Far.PI scientific-technical journal 2017, volume 21, № 2

6.Tikhtakuziyev A. Mechanical-technological basis of increasing the efficiency of the work of soil processing machines of cotton growing complex: Doctorial dissertation of tech. sciences–Yangiyul,1998.–p.336.

7.Chirtsov S.P. research and base of the parameters of working organs for sowing cotton seeds with heating гребней: Abstract of dissertation work of the candidate of tech. sciences. – Yangiyul, 1978. – p.18.

8.Sineokov G.N., Panov I.M. Theory and calculations of soil processing machines. – Moscow: Machinebuilding, 1977. – p.328.

9.Kanaev F.M. Rotation soil processing machines and tools.– Moscow: Machine

building, 1983. – p.346.

10. Tukhtakuziyev A., Nasritdinov A.A. Interaction of spherical disc with the soil. // Вестник of Russian academy of agricultural sciences. – Moscow, 2000. – №6. – p. 76-77.

11. Kirgizov Kh.T. Base of the parameters of working organs for soil processing under sowing the repeated fodder cultures: Dissertation work of the candidate of tech. sciences. – Yangiyul, – 1999. – p. 8-35

12. Mamatov F.M. Theory and calculations of flat disc knives of agricultural machines, – Karshi: Nasaf, 1992. – p.88.

13. Ponomarev E.I. Base of parameters of the working organ for forming the crest and beds under sowing the cotton seed: Dissertation work of the candidate of tech. sciences. – Yangiyul, 1984.–p.141.

14. A.N. Khudayarov D.A. Abdullayev, M.A.Yuldasheva, I.Nazirjonov “Researches carried on the determination working surface, length of the combined aggregate softener” International conference on “Agro industrial complex for science, education and innovation, problems and future” T.-2019.

15. Tukhtakuziyev A., Khudayarov A.N. determination of movement speed of soil parts on working surface of the spherical disc // Techniques in agriculture. M.,2009. – №4. – p.44-46.

16. Tukhtakuziyev A., Khudayarov A.N. investigation of the process of making beds by the tillage of the combined aggregate// AGROILM appendix of the journal “Uzbekistan’s agriculture”. №1, 2018. p.84-85

17. АН Худоёров, МА Юлдашев, Д Худойназаров. “[Комбинированный агрегат для подготовки почвы к возделыванию саженцев декоративных деревьев](https://scholar.google.com/scholar?hl=ru&as_sdt=0,5&cluster=15165497653275888509)”. https://scholar.google.com/scholar?hl=ru&as_sdt=0,5&cluster=15165497653275888509

18. АН Худоёров, ДА Абдуллаев, МА Юлдашева, Д Худойназаров, И Назиржонов. “[Комбинациялашган агрегат ўғит солгич-](#)

[таксимлагични ўлчамларини аниқлаш бўйича олиб борилган тадқиқотлар](#)”. //DEVELOPMENT ISSUES OF INNOVATIVE ECONOMY IN THE AGRICULTURAL SECTOR//. Дата публикации 2021/4/7. Страницы 966-972. <http://papers.conference.sbtsue.uz/index.php/DIEAS/article/view/251>

19. АН Худоёров, МА Юлдашева, ИА Назиржонов, Д Худойназаров. “[НОВАЯ ТЕХНОЛОГИЯ ОБРАБОТКИ И ПОДГОТОВКИ ПОЧВЫ К ПОСЕВУ НА ПЛАНТАЦИЯХ ЛЕСНОГО ХОЗЯЙСТВА](#)”. //РАЗВИТИЕ НАУКИ И ТЕХНИКИ: МЕХАНИЗМ ВЫБОРА И РЕАЛИЗАЦИИ ПРИОРИТЕТОВ, 34-39. 2019 г. <https://www.elibrary.ru/item.asp?id=41204709>

20. A.N. Khudoyorov, D.A.Abdullaev, M.A.Yuldasheva, D.J.Khudoynazarov, M.Kholdarov, I.Nazirjonov. “Results of the research on the basis of the parameters of the working body forming the irrigation equipment of the combined aggregate”. //INTERNATIONAL JOURNAL OF PSYCHOSOCIAL REHABILITATION//. DOI:10.37200/IJPR/V2419/PR 290394. Pages:3720-3727.

21. A.N.Khudoyorov, M.A.Yuldasheva, M.Kholdarov, I.Nazirjonov. “Results of research that conducted on software work length foundation.” //IV International Multidisciplinary Conference «Recent Scientific Investigation». Proceedings of the Conference// (June,2020). Primedia E-launch LLC, Shawnee,USA.2020. P.85-91