

## Improved design of universal-combined cultivator-fertilizer

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**Abstract** -In the cultivation of high yields of cotton, the role of agro-technical measures, including timely quality processing and deep softening between rows of cotton is very important. However, due to the lack of sectional cultivators currently used, it is not planned to aggregate it with a tractor and spend a lot of labor and time to install the necessary working bodies, as well as deep loosening of the soil.

In order to solve the problem, the article presents the results of research on the development of a new universal-

combined design of a suspended cultivator, which works between rows of cotton. The design of the proposed suspension universal-combined section cultivator-feeder is relatively simple, the cotton is processed and fertilized between the rows and deeply softened when necessary.

**Keywords.** Agrotechnical measures, inter-row cultivation of cotton, cultivator, working body, deep softener, combined aggregate, fertilizer, first cultivation, axial tillage, rotary tillage, universal cultivator.

### 1. Introduction

It is known that agro-technical measures play an important role in the production of high quality cotton. Especially among agro-technical measures the quality of timely processing and deep softening of cotton between rows is very important. This is because the removal of weeds by cultivating between rows of cotton, keeping the surface layer of the soil porous, fine-grained prevents excessive evaporation of moisture, the rise of salts in the lower layers of saline soils, improves heat and air circulation, resulting in accelerated soil microorganisms, root rot and pathogens that cause gonorrhea are eliminated, and the respiration of the plant root is optimized [1].

Softening of cotton row spacing improves soil structure, increases water permeability and porosity, reduces bulk density, and also ensures efficient use of water.

Many scientists have done research to determine the depth and number of cultivation according to the mechanical composition of the soil, salinity level, groundwater level and biological characteristics of cultivated cotton varieties, and cultivation depth of 10-12 cm between rows when cotton is 60 cm wide. Recommendations have been made that the cultivation depth should be 12-14 cm at 90 cm [2,3].

A number of researchers stratified the tillage between rows of cotton in the region of gray soils (first cultivation 6-8 cm, subsequent 12-14 cm; first cultivation 10-12 cm, subsequent 15-16 cm and the first 17-18 cm, the latter 12-14 cm depth) [4,5].

Latitude - physical, water-physical and microbiological properties of the soil changed positively when the cotton was loosened to a depth of 26-28 cm compared to 12-14 cm between rows of cotton in the grazing lands of the desert [6,7].

Intercropping of cotton is currently carried out using cultivators KRH-4, KRH-3,6 and cultivator KHU-4. In these cultivators, the main soil loosening working body is used, such as a horizontal shearing plow, a horizontal shearing plow, a universal plow plow and a rotary plow, depending on the soil conditions. Cultivators with such a set of working bodies have been used for many years.

In recent years, in cotton growing, after the inter-row cultivation of cotton using the above technology, deep loosening of inter-row spacing is carried out between 1 and 2 or 2 and 3 cultivation intervals. However, in this case, the deep softener is installed on the cultivator, which is used in practice, and the cultivation of cotton between the rows is carried out by the separate entry of the tractor unit into the field, which leads to increased costs. In addition, the replacement and installation of the necessary working bodies on the frame and grilles of the cultivator used requires a lot of labor and time, as well as is not

compatible with the system of creating modular or sectional variants of agricultural machinery.

Therefore, taking into account the above, the Andijan Institute of Agriculture and Agrotechnology has developed a new universal-combined design of a suspended cultivator, which provides inter-row cultivation of cotton and deep loosening of the layer (**Figure 1**).

The cultivator consists mainly of two parts, on its suspension device (14) is mounted a frame (19) and a section of grids (11). The section of grids is made separately for each row, which are mounted on the frame by means of columns (20) and guides (13). The height of the cultivator frame is connected by a finger through the holes in the guide and columns, up or down, depending on the height of the buds.

The main grille is equipped with a support wheel (2) and axle claws (5.7) that soften the center between the rows, as well as a deep softener (8). In order to reduce the resistance forces acting on these working bodies, they are installed at different depths and soften in the stepping between rows. Also, another reason for step softening is that the claws that work at the same depth as the row spacing need to be softened. In addition to the softening, an irrigation ditch is also opened at a specified depth through the working body (9).

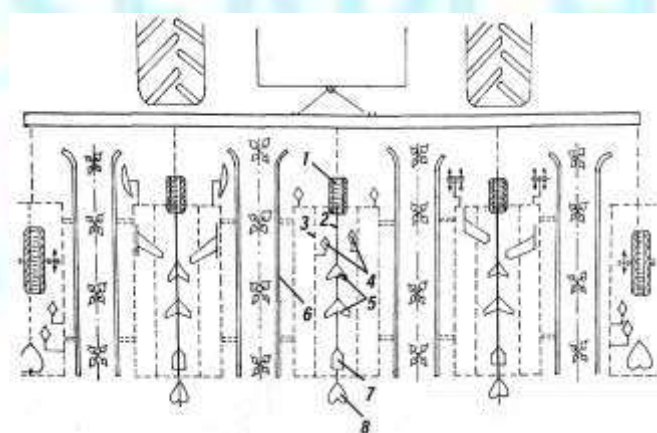
**a-** side view of the cultivator, **b-** view from the front of the cultivator.

1 - tractor wheel, 2 - base wheel, 3,4 - rotary softener claw, 5,7 - bullet spring claw, 6 - softener-fertilizer, 8 - deep roller, 9 - watering trough opener, 10 - lock, 11 - grill, 12 - fixer, 13 - guide, 14 - hanging device, 15 - bunker, 116 - meter, 17 - fertilizer conductor, 18 - support wheel, 19 - frame, 20 - grids column.

**Figure 1. General schemes of universal-combined cultivator fertilizer.**

By cultivating the soil, the process of fertilizing can be carried out at a specified distance from the row of cotton. For this, the frame is equipped with a fertilizer hopper (15), a fertilizer dispenser (16), a fertilizer unloader (17) and a softener-fertilizer (6), which receives the movement from the support wheel (18).

The diagram from above shows the lubrication of the gryadil sections between the cotton rows is shown in **Figure 2**.



1 - the base wheel of the section, 2 - the central grid, 3 - the side grids, 4 - the rotating claws, 5 - the claw claws, 6 - the protective rail (cowl), 7 - the deep softener, 8 - the irrigation ditch opener.

**Figure 2. Schematic of the location between the rows of the griddle section.**

In this case, the central gryadil (2) is mounted by means of locks (5) and deep softener (7), which are the main working organs, and the side gryadil 3 by means of rotating claws (4). Taking into account the period of cotton development, soil condition and other factors, it is planned to adjust the working bodies required for the cultivator section of

the cultivator to the specified depth (shown between other rows), and to install protective strips (6) to prevent damage to cotton seedlings.

Unused working bodies are lifted. At the end of the cultivation process, the cultivator is quickly separated from the tractor by three points of attachment of the hanging device and mounted on special supports.

### Conclusions

1. Although the current cultivators provide for loosening the soil between rows of cotton with various cultivators, they are not sectional, so deep loosening of the soil is not provided, as it takes labor and time to aggregate with a tractor and install the necessary working bodies.

2. Although the design of the proposed universal-combined section cultivator fertilizer is relatively simple, cotton loosens and fertilizes the soil between the rows and deepens when necessary.

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