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WAYS TO INCREASE THE PERFORMANCE OF CHISEL-CULTIVATORS AND REDUCE ENERGY CONSUMPTION

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Abstract: ***Pre-sowing tillage occupies an important place among agrotechnical measures for high yield of cotton and other agricultural crops. The main task is to soften the land to a specified depth, to create a soft soil layer on the surface of the field, to level it and to compact it to the required level, to preserve the moisture accumulated in the fields in autumn-winter and early spring, to eliminate germinating weeds and, most importantly, to remove seeds and other seeds. is to create conditions for uniform sowing and harvesting.***

Keywords: ***chisel-cultivators, widely, layers.***

ChKU-4 and

ChK-3.0 chisel-cultivators are the main equipment and are widely used. But these chisel cultivators have been produced for the last 30-40 years without any significant changes. For this reason, they do not meet modern requirements such as minimal and economical tillage, they are material and energy-intensive (especially the ChKU-4A cultivator), and their work quality does not meet the requirements in most cases. On the basis of these points, special studies were conducted to improve the existing chisel-cultivators in terms of increasing their work quality, reducing their material and energy consumption. Our research has shown that there are the following main ways to improve the existing chisel-cultivators in the indicated directions:

- achieving deformation and disintegration of as much soil as possible by the working bodies of chisel-cultivators in conditions of open cutting;

- to ensure that the soil is fully layered by the work bodies of the chisel-cultivators.

It is known that in the process of work, the working bodies of soil tillage machines work in closed or open cutting conditions, depending on the location and shape of the frame. When working in closed cutting conditions, it has solid soil on both sides of the blade it is processing, and when working in open cutting conditions, there is an open edge or softened zone on both sides of the blade. According to the conducted studies , the resistance to traction of working bodies working in open cutting conditions is 1.5-2.5 times less than the resistance to traction of working bodies working in closed cutting conditions. The main reason for this is that under the influence of the working body operating in open cutting conditions, the soil is fragmented along the horizontal plane towards the

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lateral softened zones. As a result, the resistance force generated by soil deformation decreases [4]. Therefore, in order to reduce the energy consumption of chisel-cultivators, under the influence of their working bodies, as little soil as possible should be deformed and broken up in closed cutting conditions, and as much soil as possible in open cutting conditions. In addition, in order to achieve high results in ensuring energy-resource efficiency, working bodies working in open cutting conditions should deform the soil slabs in the direction of open slopes or softened zones. These are mainly provided by the arrangement schemes of the working bodies of chisel-cultivators in their frame, their type, shape, and the correct selection of the direction of impact on the soil, including the installation of a softener in the front row and bullet-shaped claws in the subsequent rows.

When the soil is worked in layers, the quality of its compaction is improved and the migration of large lumps is prevented. This is especially important for chisel-cultivators, who are considered a tool for pre-sowing tillage, because ensuring soil compaction at the required level during pre-sowing tillage is the most important and basic agrotechnical requirement.

In the existing chisel-cultivators, the working bodies are installed in three rows in a checkerboard pattern, and it is possible to install them in steps, that is, to work in layers on the soil. In this case, the second line of work bodies

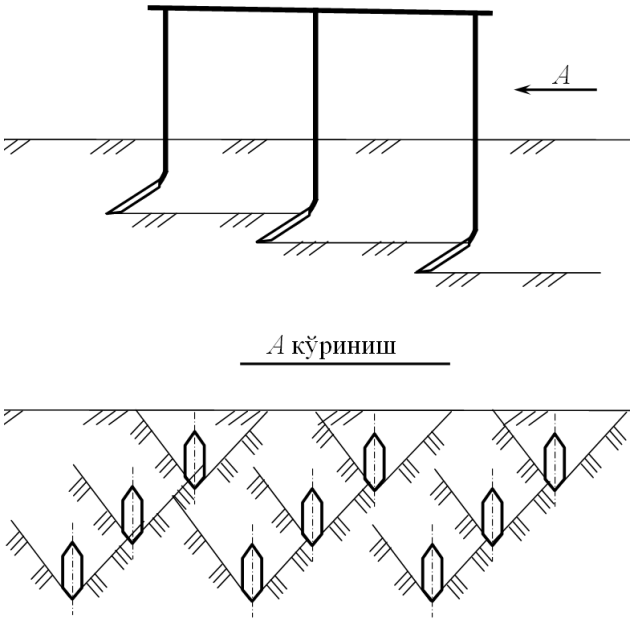

Figure 1. Scheme of installation of working bodies of existing chisel-cultivators for layering processing

It is installed so that it goes deeper than those of the first row, and the working bodies of the third row go deeper than those of the second row (Fig. 1). But since they are installed in a checkerboard pattern, it is not ensured that the soil is completely covered. This can be seen from the diagram in Figure 1.

Full layering of the soil can be achieved by sequentially installing the front and rear working bodies of the chisel-cultivator.

Based on the above, an improved chisel-cultivator was developed (Fig. 2). In this chisel-cultivator, working bodies are installed in three rows, similar to the existing ChKU-4 and ChK-3.0 chisel-cultivators.

However, in order to ensure energy saving and improve the quality of soil compaction, in the improved chisel-cultivator, the working bodies of the first and second rows are arranged in a checkerboard pattern, and the working bodies of the second and third rows are installed in a row. In addition, the working bodies of the first and third rows are set at the same working depth, and the working bodies of the second row are set at a shallow working depth compared to the working bodies of the third row.

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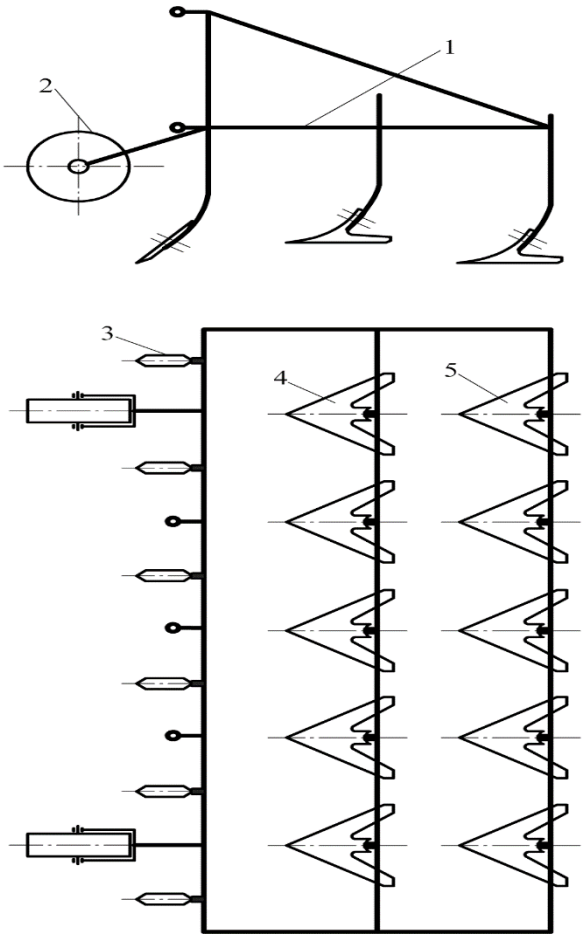
In the process of work, the working bodies of the improved chisel-cultivator located in the first row affect the whole soil, that is, closed



1-frame equipped with suspension device; 2–base wheel; 3-softening paw; 4, 5 – arrow-shaped paw

Figure 2. Scheme of an improved chisel-cultivator

works in cutting conditions, and the working bodies located in the second and third rows affect the soil slabs with softened zones formed by the working bodies located in the first row on both sides, and therefore work in open cutting conditions.

The main task of the working bodies located in the first row is to form softened zones on the sides of the blades they are acting on, so that the working bodies located in the second, second and third rows can work in open cutting conditions. Therefore, they are made in the form of a two-sided flat blade, that is, a narrow softener with a flat surface. Because it first ensures deformation of the soil towards the field surface, that is, the open surface- and, secondly, the volume of the soil being deformed under closed cutting conditions decreases. Both of these factors lead to a decrease in energy consumption .

The working bodies of the improved chisel-cultivator located in the second and third rows are made in the form of a three-sided blade, that is, an arrow-shaped claw. In this case, firstly, deformation and fragmentation of a large volume of soil is achieved under the conditions of open cutting, and secondly, it is ensured that the soil slabs processed by the working bodies are not deformed in the direction of the zones softened by the working bodies of the first row, and as a result of this, the energy capacity is reduced .

In the developed chisel-cultivator, the alignment of the working bodies located in the second and third rows and the installation of the working bodies of the second row at a shallow depth of cultivation compared to the working bodies of the third row ensures that the soil is worked in layers, and as a result, the quality of its compaction is improved.

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In order to reduce energy consumption and improve the quality of the soil, the improved chisel-cultivator has a width of 50-60 mm, a width of 300-340 mm, and a maximum width of 400 mm in the second row. showed that the working bodies located should be installed 60-80 mm higher than the working bodies of the third row.

Summary: Effective ways to reduce the work performance and energy consumption of chisel-cultivators are to achieve deformation and disintegration of as little soil as possible in closed cutting conditions, and as much as possible soil deformation and decomposition in open cutting conditions, as well as to ensure that the soil is fully layered.

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