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Directions of Development Ground-Level Processing Plugs

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Abstract: In Uzbekistan, cotton and its accompanying crops are cultivated in specific soil and climatic conditions. The article analyzes the technologies and design features of plows for basic tillage of the cotton-growing zone. A combined frontal plow for smooth, rowless plowing is proposed. The devices and the principle of operation of the plow are given. It has been found that when using a frontal plow, direct costs per hectare are reduced by 55-60% compared to the existing technology, and fuel consumption by 57-60%.

Keywords: plow, smooth plowing, longline plow, unit, tractor, technology.

Introduction. The call to "produce more products" due to the intensive development of new lands for sowing cotton and other crops turned into a terrible disaster for humanity. The environmental situation in the Central Asian Republics has deteriorated sharply as a result of a decrease in the water level in the Aral Sea. The ecological situation in the cotton-growing area largely depends on the agricultural, mainly cotton orientation of the region. In recent years, there has been a deliberate reduction in cotton crops. The development of land for agricultural crops has been stopped [1-3]. In this regard, at this stage, the only way to further develop cotton farming, including other branches of crop production, is to increase yields. The solution to this problem requires the implementation of a set of measures to increase soil fertility. The farming system includes a whole range of different activities, among which one of the main places is occupied by the tillage system. A rational processing system is designed to ensure an increase in the potential fertility of soils, high and sustainable yields of agricultural crops with minimal labor and money per unit of output [8].

Results. Due to the widespread use of the method of cultivation of agricultural crops based on intensive technologies, the requirements for the quality of land cultivation are increasing sharply. High-quality preparation of fields for planting can be achieved only by plowing the land flat. The flat plowing method imposes great demands on the quality of plows [9]. Based on the analysis of the general laws of development of driving units and their development direction, the following technical processes for the creation and use of flat plow plows in Uzbekistan can be expressed: creation and use of rotary plows for urgent work ; creation of two-tier plows with passive working organs without scythes; to create plows with a combined working body that crushes the stalks of the medium-urgent soil cultivation unit, flattens the soil and prepares the soil for planting, spreads fertilizers and plants crops in one pass, and apply. In cotton growing areas, including in the conditions of the Republic of Uzbekistan, tillage with two-tier plows is the most effective agrotechnical plowing method. Therefore, it is necessary to immediately carry out work on the creation and implementation of two-level compacted small-sized rotary plows on a large scale [10-12].

It is known that when a wheeled tractor works with a suspension plow, the rear wheels are loaded more, and the load on the front wheels is reduced. The balance of the drive units and

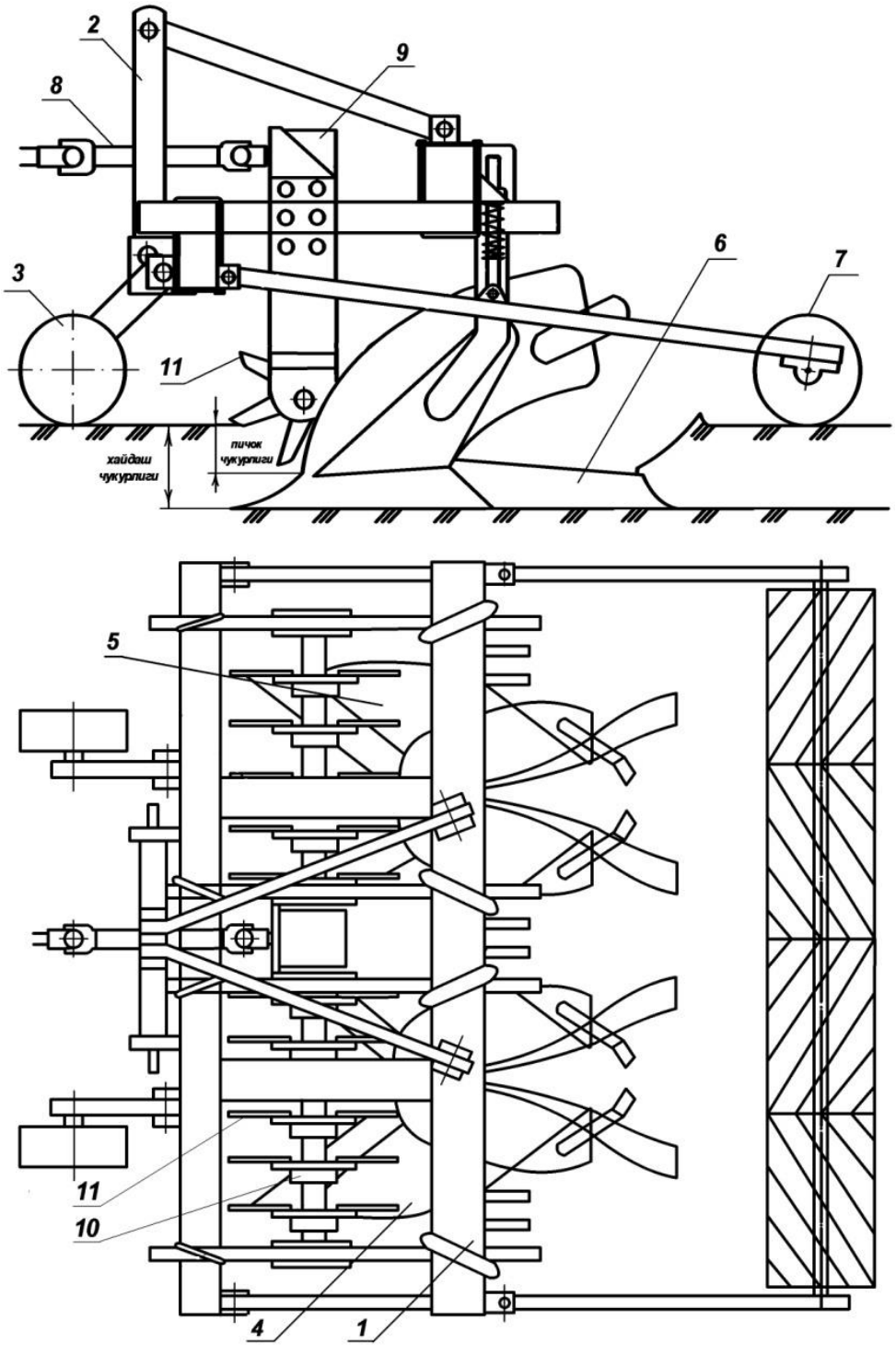
traction characteristics can be improved by hanging the plows on the front and rear of the tractor [12]. When such a unit works, the conditions of using the engine power are improved due to the redistribution of loads to the axles of the tractor and the reduction of the shaft. Front and rear suspension plow drive unit can do flat plowing with right and left tipping bodies. When the drive unit of the front and rear suspension plows works, the loads are evenly distributed to the tractor axles and wheels, in this case, the tractor's gearing mass increases; engine power is efficiently used; labor productivity increases. Therefore, it is promising to create and use a driving unit that plows the land flatly based on front and rear suspension plows.

In the future, it is planned to use regional farming systems that protect the soil, maintain soil fertility on the basis of new technologies and technical tools of tillage and tillage, and get a high yield from crops with the least effort and labor. The most promising technology is the technology of flat plowing by turning the soil blade 180° in its place. The frontal plows that implement it are small in size, have a small metal capacity, are highly maneuverable, and have a very short path of deepening into the soil.

A number of scientific and practical works were carried out at the Karshi Institute of Engineering and Economics in cooperation with scientists of the Moscow State University of Agricultural Engineering on the development and application of flat tillage technology and technical tools for cotton-growing regions. As a result, three experimental plugs were created. Two of them have a passive working body, and one is a front plow with a combined passive and active working body. For example, the PFX-2 type frontal plug with a passive working body is made symmetrically with respect to the longitudinal axis of the drive unit. It consists of plug frame 1, oppositely oriented right and left overturning bodies 2 and 3, zaplushki 4, disk blades 5, two supports 6, a traction mechanism 7 and a support-leveling roller 10 [13-17].

The plug consists of oppositely oriented right and left tilting housings, and the coverage width of each housing can be changed in the range of 45-52.5 cm. The total coverage width of the plug is 1.8-2.2 m. When the speed of the tractor is 8-12 km/h, the productivity of the plow is 1.2-1.3 ha/h. The driving depth is 25-30 cm. The soil leveling roller is hinged to the plow frame with the help of a hammer. By changing the pressure force of the spring, it is possible to adjust the level of soil crushing using the support-leveling roller [18-20].

Plugs were tested in the fields of Kashkadarya region of the Republic of Uzbekistan. According to the conducted experiments, it is determined that the main agrotechnical indicators of these sample plugs (PFX-2, PLS-3) are not lower than those of the layered plugs (PYa-3-35 and PD-3-35). The metal capacity of these plugs is 1.5-1.75 times lower than double-layer plugs, and the productivity is 25-60% higher. Flat plows ensure good loosening of the soil and high-quality leveling of the field surface. One-row crops, especially cereals, can be sown on the land cultivated by these plows. A machine based on frontal plows, which performs such processes as grinding the stubble, fertilizing, softening the soil under the plow layer, complete preparation of the soil for planting, planting, and furrowing in one pass with flat plowing of the land. and aggregates can be developed.



Symmetrical frontal plug with passive working body: 1 – frame; 2 – body that turns to the right; 3 – left-turning body; 4 – zaplujnik; 5 – disc-shaped knife; 6 – support wheel; 7 – towing device; 8 – zaplujnik handle; 9 – bracket; 10 – support-leveling roller

According to the calculations, when using integrated frontal plugs, all economic costs are reduced by 2.5 times, that is, the total labor costs for the annual work volume are 67-70%, operating costs are 55-60%, capital costs are 53- 58, and the mentioned costs are reduced by 55-59%. In addition, fuel is saved up to 57-60%, and productivity increases by 27-30% [20]. The cost of grain crops is reduced by 20-25% due to the complete preparation of the land for sowing in one go by the integrated plow. In addition, productivity increases by 2-7% due to prevention of soil compaction. In the conditions of Uzbekistan, when intermediate crops are planted, it is possible to get a double harvest from grain crops.

It is promising to turn frontal plugs into universal machines. Preliminary research showed that it is possible to create universal machines based on these plows, which, in addition to flat plowing by overturning the plow, can perform such tasks as drawing the land and fully preparing it for planting, milling, crushing the stalk, making ditches and furrows. Therefore, it is appropriate to carry out large-scale scientific-testing and pilot-construction work on the creation and application of frontal plugs working on the basis of new technology in our republic.

Conclusion. It has been established that the most promising in the cotton growing zone are plows for smooth, furrowless plowing. It has been established that when using a front plow, direct costs per hectare are reduced by 55-60% and fuel consumption by 57-60% compared to existing technology.

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