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SELECTING THE OPERATIONAL DIAGRAM OF THE ENERGY-EFFICIENT UNIT THAT WORKS IN FRONT OF THE SOIL BEFORE PLANTING

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Abstract:
The article discusses the structure, working principles, significance, and advantages of the work body that installs the soil that is intended to be planted into the machine that prepares the soil by passing through the storage, mixing, and wet transport conveyor.

Keywords: Tilling machine, plow, wet conveyor, soil fraction, processing level, storage, mixing, extending, compacting, resistance to traction, agrotechnical requirements, short-term soil preparation for planting.

Introduction

The Presidential Decree of the Republic of Uzbekistan dated March 29, 2018, numbered PF-5388, titled "Additional Measures to Ensure Sustainable Development of Horticulture in the Republic of Uzbekistan, Increase the Production of High-Quality and Competitive Products, Expand Export to Major Foreign Markets, as well as Ensure the Effective Implementation of Tasks Defined in the Strategy of Actions on Five Priority Areas of Development of the Republic of Uzbekistan for 2017-2021," highlights the importance of enhancing fruit and vegetable cultivation in the country [1,2,3].

Currently, the cultivation of vegetables and fruits in Uzbekistan encompasses various types of crops, with onion being the most widely grown crop, cultivated on over 50,000 hectares of land. Despite this, the production of vegetables and fruits does not adequately meet the population's needs. One of the main reasons for this is the lack of sophisticated technologies necessary for agricultural advancement, as well as the inability of existing markets and agrotechnical requirements to fully respond.

This article describes the structure, operation principles, importance, and advantages of the implement that prepares the soil for planting, mounted on a machine that prepares the soil in one pass of the unit by tilling, cultivating, and feeding the soil into the wet conveyor, [4,5,6,7].

Methods

The article emphasizes the improvement of the potato digging machine to adapt it for quick tilling of fields for planting vegetables, cotton, potatoes, and other crops in short periods. It aims to enhance the machine's resistance to clogging by expanding the range of cutting tools used [8,9,10].

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Results and discussion

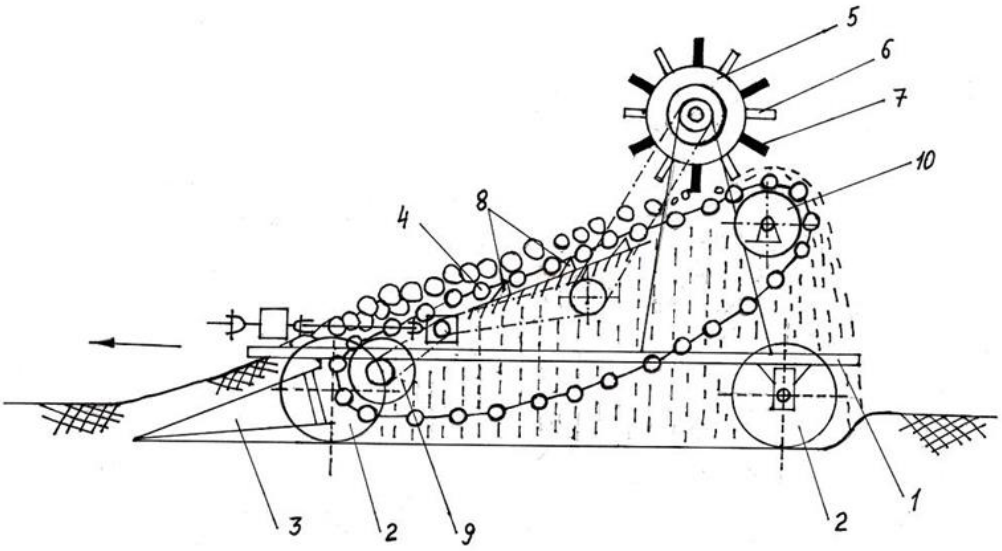
Preparing the land and planting early crops in early spring is considered one of the most critical steps in vegetable and fruit cultivation. The primary goal is to create a good tillage layer through soil compaction, proper storage of harvested crops, cleaning and processing of remaining plant residues to prevent diseases and pests, and the elimination of weed growth.

In the cotton-growing regions of Uzbekistan, technologies are used for soil preparation and land cultivation, including plowing, harrowing, leveling, sowing, watering, and harvesting, carried out using various agricultural machinery and equipment. These processes involve significant labor, fuel, and other resources, with the repeated passage of machinery leading to soil structure degradation and erosion of the arable layer. In addition, existing technologies may not fully meet the increasing global demands for soil conservation and sustainable agricultural practices.

It is known that combining machinery and equipment for land cultivation involves several or all technological operations. As a result, harmful effects on the soil from tractor chains and rakes are minimized, work quality and efficiency are increased, the duration of soil cultivation is reduced, moisture retention is improved, and overall resource consumption is reduced.

In this regard, a high-quality, multitasking machine for land cultivation has been developed based on the template of a card index in the “Mechanization of Agriculture” department at the Karakalpak institute of agriculture and agrotechnology.

The technical operating scheme of the machine is shown in picture-1



1-picture: Technological working scheme of the seeding machine operating in front of the soil.

1 – frame; 2 – tines; 3 - implement that cuts the soil layer (lemex); 4 - movable conveyor; 5 - drum that pulverizes remaining pieces; 6 - screw conveyors; 7 - screw conveyors attached to a solid plate; 8 - non-reversible spikes for conveying; 9 - rotating star; 10 - receiving star

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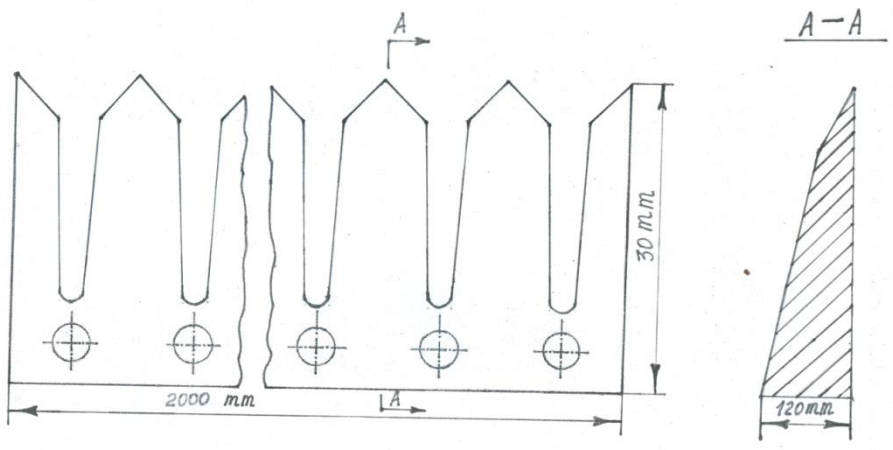
The primary functions of the machine are attached to the main frame. The machine that works on the soil before planting operates in the following sequence. As the machine moves, it cuts through the topsoil layer at a depth of 3 lemex and extends it to the rear through extension 11. The rear transporter extends the topsoil cut at 4 meters, unloads it onto the ground, and the topsoil leftover pieces are delivered to the topsoil blender drum 5. The soil blender drum 5 loads the remaining pieces back onto the rear transporter, and by using the screw conveyors 6, they are mixed and then redistributed back onto the ground.

It is possible to separate and remove weed seeds and other impurities found in the soil by sieving them onto the surface or by collecting them in a dedicated bunker and then removing them to the surface.

If necessary, the machine can spread mineral fertilizers behind the next seed row, allowing for weed control. Additionally, it can be used to harvest potatoes, vegetables, and similar crops.

The drawback of this machine is that the comb's teeth do not move, so various things may get caught and hinder its operation, complicating the process. As a result, there is a need to stop the machine and clean the comb periodically. Therefore, our main task is to create a rotating drum to move the comb teeth, providing the possibility for this.



2-picture: Diagram of a toothed cutting mechanism that cuts the soil layer.

The advantage of the new machine that cuts the soil layer and delivers only large clods to the conveyor is not to process all the soil from the deep layer, but only to reduce resistance by delivering only large clods to the conveyor, thereby reducing energy consumption (2-picture).

The design of this implement features a curved section below the front part of the machine relative to the horizon, where the wings of the plows are semi-circular and the space between the plows decreases. The operation process is as follows: the tilled soil with a depth of 12-16 cm is taken in, the fine particles in the tilled soil are pushed from the middle between the plows downwards, and only the large soil clods are pushed upwards by the turning force of the machine for subsequent delivery to the wet conveyor.

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Conclusion

By referring to the reviewed literature and patent information, it has been confirmed that the installation of cutting tools on the machine is aimed at preparing the tilled soil to be suitable for planting with low energy consumption, meeting the requirements in terms of efficiency.

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