INSTALLATION ANGLE OF IMPROVED TEMPORARY DITCH DIGGER BLADE WITH DISC BLADES AND ROLL

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Abstract: *This article describes the research conducted on the analysis of the technological processes of digging a temporary ditch. Also, the dimensions of temporary ditches, their location and cross-section schemes are indicated. The results of the preliminary research on the development of a temporary ditch digger with three disc blades in front of the ditch digger and a roller to compact the ditch bottom to the required level in order to reduce the traction resistance of the ditch digger and to dig a quality ditch are presented.*

Key words: *Roller, ditch digger, temporary ditch, irrigation, disc knives, furrow, water consumption, irrigation rate, climate, vegetation.*

In many countries around the world to ensure food security including One of the most common irrigation methods in the Republic of Uzbekistan is surface irrigation. It includes the width, length of the field, the time it takes for the water to reach the end of the field, and the total time of irrigation, depending on the conditions of the irrigated field. Irrigation is a simple, low-cost, don't much labor-intensive method. In irrigated agriculture, water is distributed over the soil in a simple way, and it is subdivided into tillage, furrow, irrigation from on the ground [1]. In this method, temporary networks are used to irrigate the land. Temporary networks will be dug at the beginning of the irrigation season and leveled at the end of the irrigation season so as not to affect the autumn-winter operations. In the climatic conditions of Uzbekistan, temporary branches of irrigation canals, ditches, furrows, corridors and irrigation canals are among the temporary branches of irrigated agriculture. [1,2]. In the process of irrigation, water is supplied from the plot distributor to the temporary ditch, from there to the ditch, from the ditch to the ditch and to the fields. After sowing of agricultural crops in the fields leveled on laser leveling, and well prepared for planting, digging of temporary irrigation networks will begin. [2,3].

Irrigation is carried out simultaneously with the tillage of crops between rows. The depth of the edges is determined by the width of the row spacing: the row spacing is 12 cm to 18 cm at 60 cm and 15 cm to 32 cm at 90 cm [1,4].

In our initial practical and theoretical analysis, in the design of temporary ditches, mechanization of demolition and leveling of these networks, the creation of temporary ditches in the field, the condition of non-occupation of the surface, in water filtration, tillage agricultural machinery, and equipment convenient, temporary ditches water the ability to adjust consumption, water consumption for irrigation, productivity of irrigators, irrigation quality, and planned productivity are taken into account [4].

It was determined that the shape of the cross-section of temporary ditches should be selected based on their size, type of soil, and methods of construction.

In our analysis of the use of temporary ditches, it is convenient to create temporary ditches in the form of trapezoids, and their sides are strong enough, they are formed by cross-section parabolic ditches using complex techniques, and in many cases large is distinguished by the ease of use in the transportation of water from the main canals. It is known that temporary ditches are divided into semi-excavated and uplifted sections. Depending on the size of the riser and excavated sections, temporary ditches are divided into three groups. In this case, temporary ditches with equal parts of the riser and excavation, $V_k=V_q$ and temporary ditches where the excavation volume is greater than the lifting volume $V_k \rangle V_q$ as well as temporary ditches where the excavation volume is smaller than the lifting volume $V_k \langle V_q$ conditions are set [5].

Ditch diggers dig the soil, lifting excavated soil and placing it on the bank of the canal and in addition to pushing works, it is necessary to level and smooth its surface, as well as to ensure its slope. The analysis of these ditch diggers shows that, a lot of energy is required when digging ditches in hard areas, and the amount of large lumps increases in areas with low humidity and loss of geometric shape due to deformation of work equipment, in the process of digging a ditch, a large amount of energy is required to pull the work equipment, the size of the soil resistance.

In the process of creating temporary ditches, the lower part of the cutting organ should be flat, straight, and have a wedge like appearance. According to the scheme proposed by R.L.Tureski, it is necessary to raise the working equipment to a certain height h0 in order for the movement of the working equipment to move freely to the edge of the channel (ditch).

If the working device is considered as an object (body) that cannot be severely deformed, in this $AC_1 \le AB.$ its circulation may occur.

$$AB = \frac{b}{2} + hctg\lambda \qquad (1)$$

and

$$AC_1 = \sqrt{(AB)^2 + (BC_1)^2} = \sqrt{[(h-h_0)ctg\lambda + \frac{B}{2}]^2 + (h-h_0)^2} \qquad (2)$$

(1) and (2) by equating the formulas and slopes into the pit $\lambda = 45^0$ at the angle of the slope h_0 calculated relatively, we get the following:

$$h_0 = h + \frac{b - \sqrt{(4h+b)^2 - 8h^2}}{4} \qquad (3)$$

Relatively, the length of the plough is determined:

$$l = \frac{h_0}{\sin\alpha_\Lambda}$$

here α_Λ - angle of inclination of the ploughshare under the furrow (cutting angle).

The results of our research show that, such an optimal cutting angle in each type of soil There is a value of α_Λ, at which the traction resistance of the coulter has the smallest value (Table 1).

Table 1

The value of optimal installation angles of different trencher plough tooth

Types of soil	Plough tooth installation angles, grad.		Explanation
	Relative to the under the canal	Relative to the canal wall	
Peat	23.....26 25.....26 35.....40	90 90 90	W= 23.....26 - h= 66.....130
medium suglinok	33.....36 25.....30	90 45	h≤60 W= 19.....20
Suglinok	37.....43	35.....40	h≤20
Quartz sand	35	90	W= 15.....16
Mineral soil	20 32.....36 29.....32 28.....32 25 26.....30	90 90 90 90 90 90	- - - - - h≤50

Ditches dug using different types of trench plows carry different amounts of water, which in turn requires that the height of the dams be at least 0.1 meters to block the water from the water level in the temporary ditch.

We have seen that temporary ditches, the edges of which are formed in muddy soils, need a 1:1 ratio.

Table 2

Dependence of water consumption on the size and slope of the temporary canal

The slope of a temporary ditch	Water consumption, l/s							
	20		40		60		80	
	The width of the bottom	Depth of water filling	The width of the bottom	Depth of water filling	The width of the bottom	Depth of water filling	The width of the bottom	Depth of water filling
0,001 to	0,30	0,20	0,50	0,30	0,50	0,35	0,50	0,40
0,001-0,003	0,30	0,25	0,40	0,30	0,50	0,30	0,50	0,35
0,003-0,006	0,30	0,20	0,40	0,25	0,50	0,25	0,50	0,30
0,006-0,007	0,30	0,20	-	-	-	-	-	-

For uniform distribution of water, the slope of the conductive branches should not exceed 0.001, in temporary ditches should not exceed 0.003, because at large slopes, and in places where a lot of water is stored, the water velocity is 80- 100 l / s and a velocity of 0.5 m / s, and it is necessary to take into account the condition of the bottom of the ditches, and the washing of the banks [6,7,8,9].

The water consumption of temporary canals is given in Table 2, Table 3.

Table 3

Dimensions of irrigation network plots

Furrow	Depth, m	The length of the upper part	Terms of use	
			soil	irrigated crop
Deep - narrow	0,15-0,18	0,35-0,50	heavy	Row crops
Deep - wide	0,15-0,18	0,4-0,55	slight	Row crops
Small - narrow	0,12-0,15	0,27-0,35	heavy	Cereal crops
Small - wide	0,12-0,15	0,45-0,5	slight	Cereal crops

During the tillage process, the soil becomes muddy. In the formation of subsequent temporary ditches, the soil is not well compacted, resulting in increased resistance to the surface to be treated in the trench excavator. The study calls for the introduction of temporary canals, given the need to provide irrigation standards for different crops, and to link them to climate change as they adapt to the growing season.

It is known that the main task of temporary canals is to meet the water needs of crops in a timely manner. To do this, the canal will be required to supply, for example, 70-100 m3 per hectare of water required for the cotton field. In this case, we can determine the expenditure of one-time irrigation for 1 hectare of land required by plants with the irrigation rate (m3 / ha) as follows:

$$Q = \frac{1000 \cdot m}{86400 \cdot t} \quad (hectare) \quad l/sek \qquad (4)$$

here: m – irrigation norm m^3/hec; t – irrigation frequency, day.

If the formula is followed, the irrigation rate is based on the type of plant or the conditions under which it is grown. However, in our experiments, taking into account the climatic conditions and soil structure of the Bukhara oasis, it is not appropriate to regulate the water in this order, and to choose temporary canals that bring water to it. Therefore, the device we are proposing takes into account the above, in order to increase the efficiency of the temporary ditch digger straight discs in the front of the dump to soften the soil, reduce resistance, soil fraction, and improve the quality of slope, and the formed temporary ditch a catoc was installed to seal the bottom. The technological process of the improved ditch digger is as follows: during the operation of the ditch digger, it is hanging on the back of the tractor and put into operation.

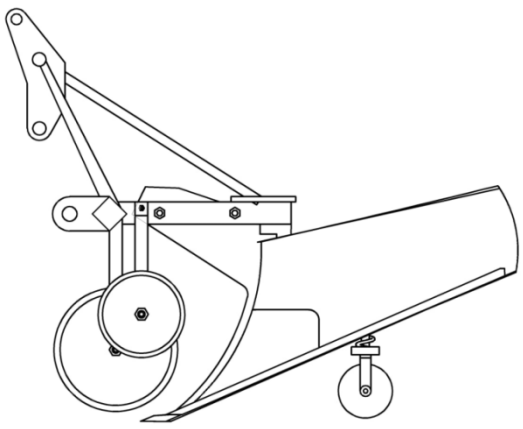

Figure 1. Improved temporary drain constructive scheme

Due to the forward motion of the tractor, the working equipment is lowered to the ground at a certain depth. In the process of digging a temporary ditch, the cutting straight discs, placed at a certain distance from each other, are cut into the soil in front of the overturner at a certain depth, moving in a circle around its axis as a result of sinking and sticking to the ground. The soil layer is pushed sideways using a roller to form a channel. As a result, gravitiy resistance of the unit is reduced during operation. In the process of digging a ditch, with the help of discs, due to the cutting of the soil layer, the slope of the side of the ditch, and the uniformity of the geometric shape is ensured, as well as compaction of the bottom of the installed ditch.

This means that with the proposed discs, the improved energy-saving channel digger can reduce fuel consumption by up compared to the existing device in the construction of temporary canals, and increase productivity by 1.5 times.

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