PROCEEDINGS OF SPIE

SPIEDigitalLibrary.org/conference-proceedings-of-spie

Technological process of provisional dig a ditch

Sh. J. Imomov, J. U. Ruzikulov, S. S. Kurbanbayev, H. S. Safarov, K. S. Sobirov, et al.

Sh. J. Imomov, J. U. Ruzikulov, S. S. Kurbanbayev, H. S. Safarov, K. S. Sobirov, Z. Sh. Isakov, "Technological process of provisional dig a ditch," Proc. SPIE 12296, International Conference on Remote Sensing of the Earth: Geoinformatics, Cartography, Ecology, and Agriculture (RSE 2022), 122960O (6 July 2022); doi: 10.1117/12.2642980

Event: International Conference on Remote Sensing of the Earth: Geoinformatics, Cartography, Ecology, and Agriculture, 2022, Dushanbe, Republic of Tajikistan

Technological process of provisional dig a ditch

Sh. J. Imomov, J. U. Ruzikulov*, S. S. Kurbanbayev, H. S. Safarov, K. S. Sobirov, Z. Sh. Isakov
Bukhara Institute of Natural Resources Management "Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research, 32, Gazli ave., Bukhara City, 200100, Uzbekistan

ABSTRACT

The article explained the research conducted on the analysis of technological processes of temporary canal digging. Also, the dimensions of the temporary ditches, their location, and transverse diagrams are also shown. In the formation of these channels, on the development of two straight discs in front of the channel-digger, and in order to reduce the gravity resistance of the channel -digger, and compaction of the channel bottom, in order to improve the channel quality the results of preliminary research are presented.

Keywords: Ditch, digging, technology, technique

1. INTRODUCTION

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 [1-2]. 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 [2]. 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 [2-4]. 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 [2-6].

2. MATERIALS AND METHODS

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 [2; 7-8].

For the excavation of temporary networks, ditch digger-leveler are used, taking into account the slope of the land. They are selected taking into account the capacity of the canal from 20-40 1 / sec to 100-200 l / sec. In our experiments, we have seen that the depth of the ditch should not exceed 30 cm, and the walls should be around 1: 4 relative to the depth of the ditch, so that agricultural machinery can pass through temporary networks. There are several types of temporary ditch-diggers used in Central Asian irrigated agriculture. In most cases, this is due to the convenience of digging ditches in KZU-0.3 ditch-diggers to meet the requirements of irrigated agriculture [7; 8].

The depth of the ditch obtained by KZU-0.3 ditch is 25 cm, the width of the bottom is 30 cm, the width of the top is 120-130 cm, and the height of the soil pile is 20-25 cm, and the water permeability of the ditch is 40-60 1 / sec [2; 7].

The hydraulic calculation of the temporary network required to determine its water filling depth, the average water flow rate, and the non-leaching of the network.

*jasurruzikulov@mail.ru

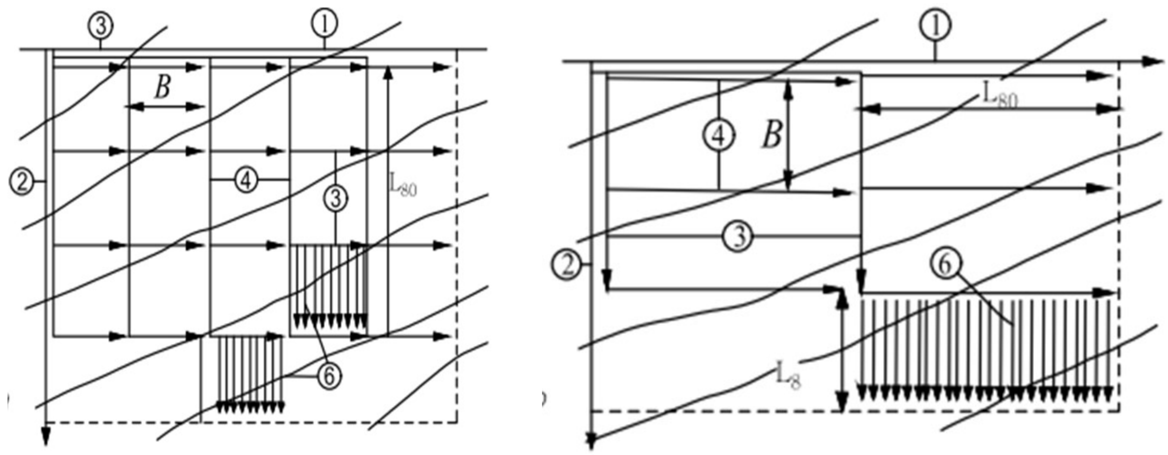
Intl. Conf. on Remote Sensing of the Earth: Geoinformatics, Cartography, Ecology, and Agriculture (RSE 2022), edited by Shahriyor Sadullozoda, Arthur Gibadullin, Zafar Usmanov, Proc. of SPIE Vol. 12296, 122960O · © 2022 SPIE · 0277-786X · doi: 10.1117/12.2642980

3. PROCEDURE OF RESEARCH

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;9].

In our initial experiments, temporary ditches were formed in the direction of the irrigation canals, transversely, and a longitudinal ditch was formed (figures 1 a and b).

Depending on the type of crop during the growing season, and the condition of the sown area, the norm of seasonal irrigation, the method of AN Kostyakov is used.



a *b*

Figure 1. Schematics of placement of temporary irrigation networks: a – longitudinal; b – transverse; 1 – inter-farm distributor; 2 – farm distributor; 3 – plot distributor; 4 – temporary ditch; 5 – bullet-ditch; 6 – irrigation furrows.

Based on AN Kostyakov's seasonal irrigation norms, in the schemes of longitudinal irrigation networks, water is sent to temporary drainage ditches, from ditches to irrigation ditches. In the transverse scheme, water comes directly from the temporary ditches to the irrigators. We choose transverse and longitudinal schemes based on the angle of the field slope to be irrigated. For small angular slopes, the longitudinal scheme ($i \leq 0.002$) is chosen, and when the field slope is large, it is advisable to choose the transverse scheme ($i \geq 0.008$). We choose the longitudinal scheme if we form the irrigation canals horizontally at an angle of less than 45˚.

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.

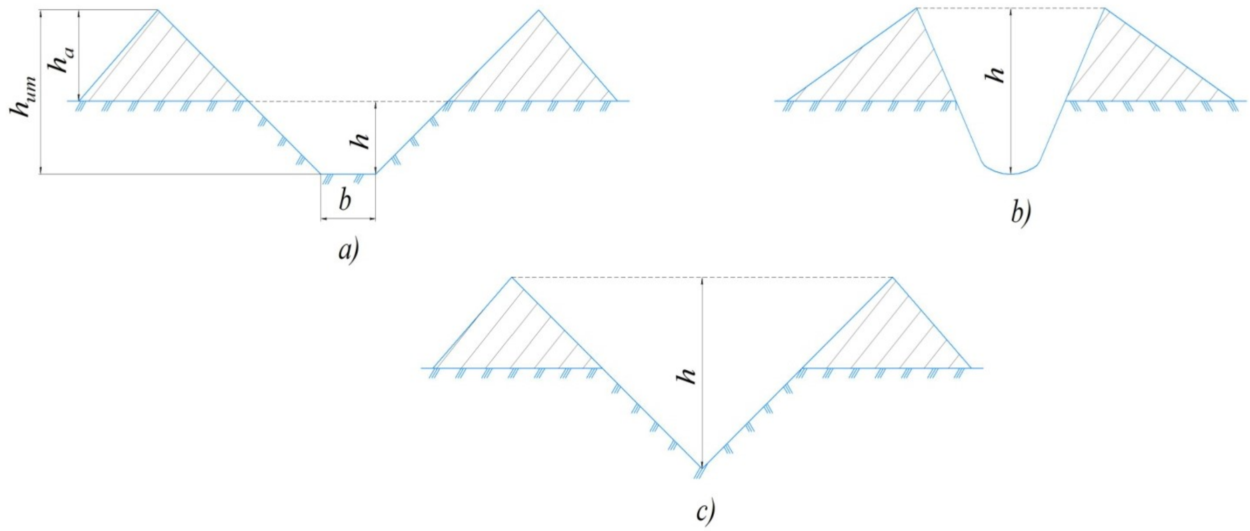


Figure 2. Cross-sections of temporary ditches: a – trapezoidal, b – parabole, c – triangular.

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 $V_k>V_q$ as well as temporary ditches where the excavation volume is smaller than the lifting volume $V_k<V_q$ conditions are set.

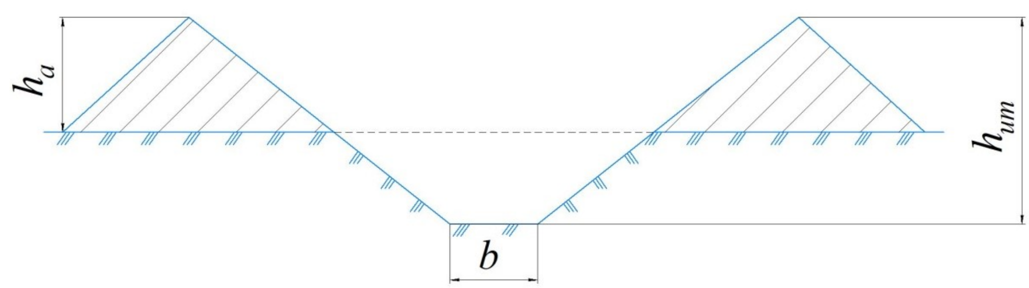


Figure 3. The cross-sectional area of a semi-excavated canal.

In the Republic of Uzbekistan, mainly temporary canals with equal excavation volume and lifting capacity are used. In this case, no additional soil volume is required to form large dams. In the above, the water level (h_k) in temporary ditches is required to be 0.05-0.15 m higher than the irrigated area. The height of the dams should be at least 0.1 m to block 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.

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 [2; 7-10].

The water consumption of temporary canals is given in table 1.

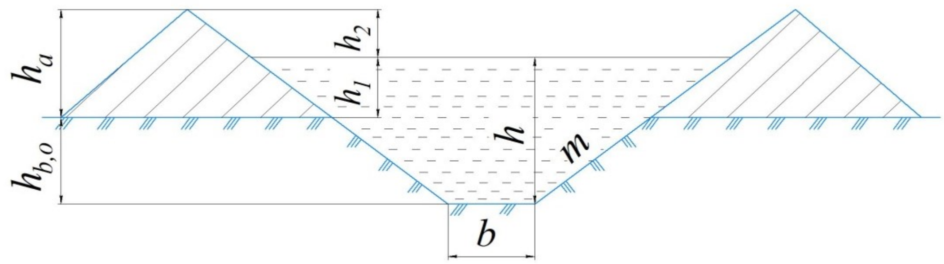


Figure 4. Basic dimensions of a temporary canal.

Table 1. 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	-	-	-	-	-	-

Table 2. 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

Analysis of the technological process of irrigation through ditches There are data on the formation of dead ditches in temporary ditches with varying depths of temporary ditches, and irrigation ditches. It is known that it will be as shown in figure 5, and the dead depth dimensions will be 8-20 cm in contrast to the trench excavator.

This shows the following shortcomings in the flow of water: water consumption increases by 2-4%, the crops cause abrupt shaking of the aggregate during inter-row tillage, damaging the cultivated plants, and after leveling the ditch, muddy soil is formed in the excavated part of it.

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.

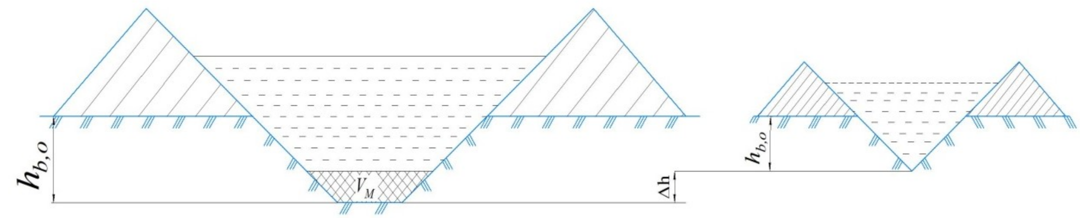


Figure 5. Scheme for determining the dead depth of temporary ditches.

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 m^3 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 (m^3 / ha) as follows:

$$Q = \frac{1000 \cdot m}{86400 \cdot t} \text{ (hectare) l/sek} \tag{1}$$

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.

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.

4. CONCLUSION

This means that with the proposed discs, the improved energy-saving channel digger can reduce fuel consumption by up to 15% compared to the existing device in the construction of temporary canals, and increase productivity by 1.5 times.

REFERENCES

[1] Proclamation of the President of the Republic of Uzbekistan to the Oliy Majlis of December 29, 2020. People's Speech December 30, 2020 son No. 276.
[2] Artukmetov, Z.A., Sheraliyev, H.Sh., Bases of crop irrigation (2007).
[3] Juraev, A., Established digging ditches machines with discs", Useful model Patent FAP, 01573 (2021).
[4] Bahramov Fakhriddin Khuzriddinovich, Substantiation of the parameters of the working body of the canal digger for cutting temporary sprinklers, Yangiyul, 8-14 (1996).

[5] Olimov, Kh. Kh., Juraev, A. A. IOP Conf. Ser.: Mater. Sci. Eng., 883, 012171 (2020).
[6] Olimov, K., Juraev, A., Ochilov, M., IOP Conf. Ser.: Mater. Sci. Eng., 883, 012170 (2020).
[7] Hasanov, I. S., Ruzikulov, J. U., Ergashov, F. A., Toshmurodova, M. J., Sotlikova, M. R., IOP Conf. Series: Earth and Environmental Science, 868, 012091 (2021).
[8] Ruzikulov Jasur Uktam ugli, Kurbanbayev Sindorbek Sarvarbek ugli, Nasrullayev Alpomish Anvarjon ugli, Safarov Khusniddin Sirojiddin ugli, Research on the establishment of an improved temporary ditch production device, Galaxy international interdisciplinary research journal (GIIRJ), 9(11) (2021).
[9] Olimov, Kh. Kh., Juraev, A. N., Imomov, S. J., Orziev, S. S., Application of energy and resource engineering software in cotton fields, IOP Conf. Series: Earth and Environmental Science, 868, 012067 (2021).
[10] Tokhtakuziev, A., Juraev, A.A., Determination of gravity resistance of the pawl structure device between cotton rows in one pass of the aggregate, ACADEMICIA: An International Multidisciplinary Research Journal, 11(8), 385-388 (2021).
[11] Tuxtakuziyev, A., Juraev, A.A., Ostonov, Sh., Olimov, Kh. Provide Working Position of Device Wiper Surface Bodies Which Create Longitudinal Pawl between Cotton Rows in Determined Deepness. RA Journal of applied research, 7(10) 2563-2569.
[12] Umurzakov, U., Mamatov, F., Aldoshin, N., Mirzaev, B., Exploration of tillage technologies in the Republic of Uzbekistan, IOP Conf. Series: Earth and Environmental Science, 614, 012168 (2020).
[13] Mamatov, F., Mirzaev, B., Toshtemirov, S., Hamroyev, O., Razzaqov, T., Avazov, I. Study on the development of a machine to prepare the soil for cotton sowing on ridges, IOP Conf. Series: Earth and Environmental Science 939 (2021).