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Groundwater as an Additional Source of Irrigation.

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Annotation

In the Fergana region, due to the change in climatic conditions, there is a problem of a shortage of irrigated water. At the same time, the region considers a low level of groundwater, which is constantly pumped out by vertical drainage wells. There are enough working vertical drainage wells in the region. But when pumping out, water from vertical drainage wells is discharged into the collector-drainage water. The goal of our field experiment is to use this water for irrigation and thereby reduce the scarcity of irrigation water.

The field experiment was carried out on a 5-hectare field of cotton cultivar S-6524. Studies have shown that the salinity of the pumped-out water at the experimental site is 1 g / l. According to the classification of use, they are suitable for irrigation. The conducted field experiment showed that the full use of vertical drainage water from one well for irrigation, with a flow rate of 30 l / s, can irrigate an average of 40 hectares of land.

The results of the experiments showed that a change in the water-salt regime of soils and irrigation with low-mineralized pumped water against the background of the adopted regime and norms of irrigation, normal agrotechnical and organizational measures did not have a negative effect on the yield of cotton. On the experimental plot, the average yield was reached within the range of 26.4-26.5 c / ha. On the control plot, when irrigated with irrigation water, the yield was slightly higher: 26.7-27 centners / ha, that is, the difference in plant productivity in the two plots was small.

Key words: vertical drainage, hydraulic structures, water supply, collector-drainage network, field experiment**.**

Introduction. Due to the fact that the number of dry years has become more frequent in Uzbekistan. And the country needs new methods to identify additional sources of irrigation. If we keep in mind that the water pumped out of the vertical drainage wells is discharged into the collector drainage network or into depressions, forming artificial reservoirs. Thus causing an environmental problem. And if we bear in mind that the mineralization of these waters does not exceed 2 g / l, then these waters can be considered as an additional source of irrigation. Studies were conducted in the Ferghana region of the Republic of Uzbekistan. In the Ferghana region, mainly water with a salinity of 1-3 g / l is formed. Natural resources of groundwater are formed in gravel and pebble deposits of the Quaternary age, operational reserves with a salinity of up to 1 g / l make up 44% of the total reserves. In the Ferghana region, weakly mineralized water is formed mainly in the southwestern part of the region (the Sokh and Isfara basins). Methodology. In the process of research, methods of system analysis, methods of field experiments, as well as generally accepted methods in land reclamation were used.

Results and discussion. A systematic analysis of the technical condition of the collector-drainage network in the Ferghana region showed that the total length of the on-farm network is 19646.2 km, the number of vertical drainage wells is 1207. [5] Kuvinsky was chosen for our research, since there are a sufficient number of vertical drainage wells. Consider a graph of changes in the working wells of vertical drainage in the Ferghana region over thirty years. In the construction of vertical drainage wells, the same building materials, mechanisms and technologies are used.

For several decades, we have carried out scientific research to study the operability of vertical drainage wells in the Ferghana region. For research, the technical condition of vertical drainage was considered in the following areas: studying the operability of pumping units, studying the condition of the shafts, studying the formation of water flow into the well, studying the condition of the filter frame, studying the completeness of the reinforcement of the ground part, studying the process of changing the flow rates and specific flow rates, studying the chemical composition of water pumped by wells, the study of the chemical composition of the products of colmatage, the study of the effectiveness of ogy, used to restore the productivity of wells.

Discussions Many scientists were involved in evaluating the use of vertical drainage: A.U. Usmanov [6;], T.U. Bekmuratov [3;, Sh. Sh. Mukhamedzhanov [17], A.Kh. Karimov [8], R.K. Ikramova [7], I. Akhmedov [2], Z.K. Mirkhasilova [12] and others.

Separate few experiments on the use of pumped water were carried out by N. M. Reshetkina and Kh. I. Yakubov [19] S.M. Vasiliev [4], R.K. Ikramov [7], Z.K. Mirkhasilova [14] and others.

In the Ferghana Valley, experiments on the use of pumped groundwater in different years were carried out by T.U. Bekmuratov [3; p.98-103], A.Kh. Karimov [8] and others.

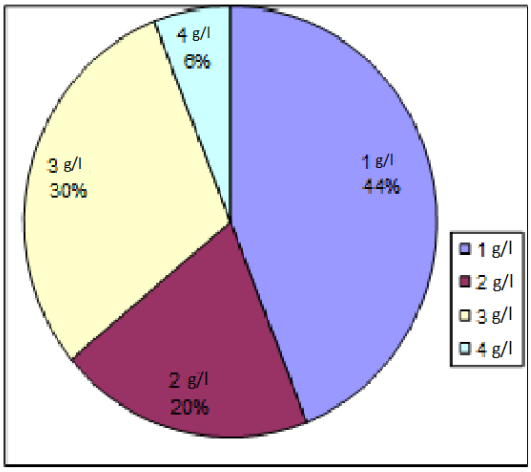
In the works of S.Sh. Mirzaev [11], etc. considered the possibility of continuous use of groundwater through the construction and operation of double-acting wells.

A review of literary sources showed that until today it remains an urgent issue on the use of part of the pumped-out water in the places of formation to fill the water shortage [6].

In the available experiments, the issues of transferring individual fields to irrigation only with underground water and their influence on soil-reclamation conditions and crop yields are not sufficiently developed.

It should be noted that the pumped water is an internal reserve of each farm; these waters could serve as an additional source of fresh water for irrigation during the growing season. The most promising are the farms of the Kuva, Rishtan and Altiaryk districts, where a sufficient number of vertical drainage wells are concentrated with an average flow rate of up to 40-50 l / s and with salinity of groundwater not exceeding 1-1.5 g / l. In these areas, underground tributaries range from 5.3 to 10.6 thousand m3 / ha, and drainage flows from 10.9 to 14.3 thousand m^3 / ha

A review of literature data showed that scientists were engaged in the construction and operation of vertical drainage to maintain groundwater levels in good condition. But if we consider that in the Ferghana region there are a sufficient number of vertical drainage wells and they perform their functions.



Pic 1. Percentage of groundwater salinity in the Ferghana region

The use of pumped water can be carried out by transferring vegetative irrigation of individual sections of the economy to full provision of pumped water. One of the important issues is the establishment of areas for which the volume of pumped water is sufficient. The possibility of transferring vegetation irrigation to the full supply of pumped water, taking into account the hydro-geological reclamation conditions of certain regions of the Ferghana region, is justified by solving the following issues:

- assessment of groundwater quality under the existing vertical drainage well system;
- determination of the actual flow rate of vertical drainage wells in the zones of fresh horizons of groundwater;
-assessment of the reclamation state of irrigated lands;
- the allocation of specific farms and areas possible for the transfer of vegetation irrigation with the pumped waters of existing vertical drainage wells;
-development of vegetation translation technologies for individual farms
irrigation with pumped water of vertical drainage.

Pumped water is discharged into the collector-drainage network. Analyzes of the water pumped out by vertical drainage wells in chemical laboratories have shown that the composition of these waters is satisfactory. And according to the classifications of our and foreign scientists, they are suitable for irrigation.

The possibility of a complete transfer of vegetative irrigation with water from vertical drainage wells, without discharging them into the collector-drainage water, had to be studied using a specific farm as an example. For example, the farm “G. Rayimjon Faith” was selected within the WUA “Musajon Ismoilov” in the Kuva

district of the Ferghana Region. A feature of the soil conditions in this farm is the small thickness of the cover fine earth, composed of light and medium loams, which are underlain by highly permeable gravels. The territory is drained by three vertical drainage wells and a collector-drainage network with a specific length of 28 m / ha.

The task of the experiments was to determine how many hectares of land can be irrigated from one well of vertical drainage, taking into account the time of irrigation, the irrigation period, etc. For example, several fields of 5 ha of cotton planting were selected.

The aim of our work is to irrigate pumped water without dumping it into the collector. For this, after the first irrigation of our field, the pumped water is diverted to neighboring fields, if the first inter-irrigation period is 20 days, then before the second irrigation of cotton, you can irrigate the same fields 5 ha 8 times, i.e. 40 ha of land. Then the interval between the second and third irrigation is 5 days, during this inter-irrigation period you can irrigate 10 hectares of neighboring lands.

In the experimental plot, cotton of the S-6524 variety was sown, and agricultural technology for growing cotton was generally accepted for farming. Cotton was sown in the second half of April with a row spacing of 90 cm.

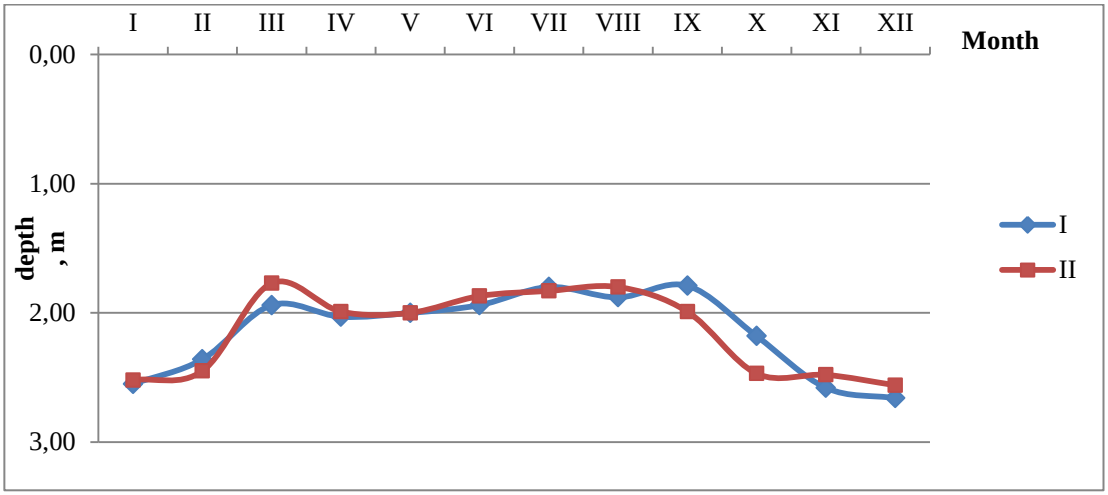
The annual fertilizer rate was - nitrogen 150, phosphorus 100 kg / ha.

The soils of the experimental plot are relatively low humus - in the arable layer its content is up to 1.0-1.1%, and nutrients: nitrogen 0.06-0.1%, phosphorus from 0.1 to 0.2%, potassium 1.8 -2.6%.

As is known, under irrigated agriculture, the groundwater regime is closely related to the frequency of irrigation and the amount of water supplied, and the regime itself is called as the irrigation itself. In the experimental plots in the dynamics of the groundwater table, two maximums and two minimums are observed.

A decrease in the groundwater level to 2.5-2.6 m is observed in the autumn and spring periods, pic. 1. Ground water level rise occurs with the beginning of the growing season to 1.79 - 1.80 m, before and after watering, in their dynamics, there are sharp ups and downs with an amplitude of 10 to 15 cm.

According to field studies, the salinity of groundwater in the areas had a composition of 1.5-2.5 g / l, characteristic of the Kuva region for the period of non-growing season when irrigating with underground water, there was a slight increase in salinity from 2.5-3.0 g / l in the composition mainly sulfate ions, followed by chlorine: on the cation - calcium and magnesium.



Pic.2. The dynamics of groundwater levels in experimental plots

I - Option using arych water; II - option using pumped water

I. Cotton Field Water Balance. Table 1. shows the calculations of the water balance of the cotton field according to the experimental options. As calculations show, the irrigation water norms prevail in the general water balance, which make up 45-46% of the income. The next place is occupied by groundwater inflow within 1952 m^3 / ha or 29 %; precipitation accounts for 15-16.3%; use of moisture reserves of 10-10.3% in two ways. The total water consumption of the cotton field during the growing season was 6944-7107 m^3 / ha.

Table 1

Water balance of the cotton field taking into account soil moisture in the layer 0-100 cm according to the options of experience

Indicators	Aryny	Underground
1. Irrigation rates m3 / ha, % of total water consumption	3150 45,3	3300 46
2. Moisture from soil reserves, m3 / ha, %	714 10,3	725 10,2
3. Atmospheric precipitation, m3 / ha, %	1132 16,3	1132 15,9
4. Groundwater, m3 / ha, %	1952 28,1	1952 27,4
Total	6946	7107

II. Change in soil moisture. The dynamics of soil moisture according to the experimental variants for 2013-2015 are shown. The data show that during the

growing season, soil moisture was maintained in the range of 69.4-74.5% of highest moisture capacity. Before IV irrigation, soil moisture decreased slightly to 69.2-70.1% of highest moisture capacity.

The results of the experiments showed that changes in the water-salt regime of soils and irrigation with weakly mineralized pumped water against the background of the adopted regime and irrigation norms, normal agrotechnical and organizational practices did not negatively affect cotton yield. On the experimental plot, the average yield was achieved in the range of 26.4-26.5 c / ha. In the control plot, when irrigation with aryky water, the yield was slightly higher: 26.7-27 kg / ha, that is, the difference in plant productivity in the two areas was small. It is obvious that the content of readily soluble salts in the soil according to the solid residue in the range of 0.300-0.330% with the sulfate-chloride type of salinity does not have a strong effect on the growth and development of cotton.

Conclusions. They are as follows:

- vertical drainage wells in a dry period can be used for irrigation and fully used for vegetation irrigation.
- the mineralization of the water pumped out from the vertical drainage wells considered by the scientists according to the classifications shows that these waters are satisfactory and suitable for irrigation;
- field experiments showed that during the growing season when watering cotton with one well of vertical drainage with a flow rate of 30 l / s, up to 40 hectares of land can be irrigated.
- watering water from vertical drainage wells will help increase water availability.

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