**UO'T:626; 631.674**

# MOISTURE MOVEMENT IN THE SOIL-SUBSOIL IRRIGATION (TOS) OF CULTIVATED LAND IN THE CONDITIONS OF THE BUKHARA REGION

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**Annotation.** The article gives a brief overview of water-saving technologies for irrigation of vegetation and the result of a study to establish the main (diameter and distance between moistening holes , water flow; moisture distribution zone) parameters of sub-irrigation.

**Annotatsiya.** Maqolada ekin eralarning tuproq ostidan sug'orib suv tejamkrligiga erishish borasida bir qator rivojlangan mamlakatlarda, jumladan O'zbekistonda mavjud er maydonlarining salmog'i va bu borada olib borilayotgan ilmiy tadqiqot ishlari,qo'llaniladigan texnika va texnologiyalar, yangi qurilma, uni qo'llashda olinadigan ijobiy natijalar, shuningdek bu muammo echimini topish borasida ilmiy tadqiqot ishlari to'g'risida ma'lumotlar keltirilgan.

**Аннотация**. В статье представлена информация о весе земельных участков, имеющихся в ряде развитых стран,в том числе в Узбекистане, и проводимых научно-исследовательских работах по достижению водосбережения за счет подземного орошения сельскохозяйственных угодий, применяемой технике и технологии, новом устройстве, положительных результатах, полученных при его применении, а также научно-исследовательских работах по поиску решения этой проблемы.

**Keywords**: irrigation from under the soil, sandy soil, saline soil, gravitational-capillary, sorbic, condensation, hydrostatic pressure.

By irrigation from the soil OS-this type of irrigation implies the supply of water directly to the root system of plants through special humidifiers located under the fertile layer or at a depth of about 10-50 CM in the fertile soil layer.

The effect of the suction forces of the pelvic soil is performed, therefore, based on the water physical property of the soil, it is possible to apply it on soils with good capillary properties. At the same time, it is not recommended to use in tos on sandy soils, saline, rocky soils.

According to the type of water supply, irrigation systems for the soil are divided into 3 groups]:

- vacuum, they are also known as adsorption with Capillary hydration. With this method, water is immediately absorbed by plants due to the suction power of the soil;

-gravitational-capillary low pressure humidification. In this case, the water in the network is distributed by the water gravity of the soil;

- capillary-gravity wetting pressure pumps. With this method, water is supplied to the soil by creating artificial pressure.

The main advantages of irrigation from within the soil [65; 25-28-b]:

- maintaining the moisture content of the soil layer at the capillary capacity level;
- absence of disturbance in the structure of the plowing horizon in irrigation;
- absence of shell formation;
- long-term storage of water reserves in the soil due to a decrease in evaporation from the soil surface;
- process automation;
- weed reduction.

Soil moisture reserves in the soil are formed by its interaction with plants and weather conditions. Quantitative indicators of the amount and movement of moisture in the soil are one of the most important factors that characterize the water regime in which the soil is formed.

Large-scale work has been carried out to study the laws of the distribution of moisture in the pelvis.G.Kornev, A.A.Bogushevski, V.P.Ostapchik, V.I.Bobchenko, V.R.Ridiger, L.E.Chernyshevskoy, A.A.Alesashenko and other researchers can be shown their work.

The movement of moisture from the humidifier under the soil occurs under the influence of various forces of Nature, This Is S.I.To classify soil moisture according to Dolgov's description, it divides moisture into three forms: sorption, free and steamy.

Sorption-acts by the soil mainly under the action of sorption forces, that is, it is associated with the surface of soil particles of water molecules and the forces of direct interaction with sorbed vapors. It is difficult for plants to get into this form of moisture. S.I.Dolgov divides sorption moisture into strong and loose ligaments. Maximum molecular humidity (MMN) is the upper limit of film moisture in the soil. The lower humidity than the MMN value leads to a decrease in the yield of agricultural crops.

Gravitational (or free) -water moves and is held in the soil under gravity or capillary forces, depending on the degree of porosity of the soil. It will be easy for plants to absorb this moisture, and when watered, it will easily turn into other forms of moisture, first of all, capillary moisture.

For most pelvic methods, the distribution of moisture in the upper soil layers with Capillary hydration from below in a relatively short period of time is of great importance. The rate of up-capillary dispersion of moisture is less than the rate of down-and side-dispersion. This creates certain difficulties in moistening the upper soil layer with the capillary action of moisture, without losing water to the lower layers. Sandy soils are able to retain capillary moisture no more than a certain volume of water. An increase in this amount leads to the fact that not only the extra volume of water flows out, but also most of the previously preserved water. Clay and clay soils, unlike Sands, can keep large volumes of capillary water hanging. Therefore, an increase in the rate of watering does not lead to a significant decrease in the moisture content of the upper layers of the soil. The rate of capillary action of moisture in the soil is also affected by moisture before watering. With high pre-irrigation humidity, the rate of movement of capillaries in the soil increases, but in moist soil, the specific water consumption for the movement of capillaries is less than in dry soil.

The value of gravitational moisture during the pelvis is very small, and often it negatively affects the distribution of watering speed, leading to an increase in water loss in the lower layers of the soil. With this method of irrigation, gravity water is allowed in such volumes when it easily passes into capillary water inside the active soil layer. The TOS technique can ensure the partial upward movement of gravitational moisture under the influence of hydrostatic control created in the humidifier. This contributes to the proximity of the soil to the surface and the expansion of the moisture limit, which makes it possible to increase the distance between humidifiers and thereby reduce the cost of building pelvis systems.

Condensation (or vapour-like) - water diffusively moves in soil pores that are not filled with liquid water, mainly under the influence of differences in the elasticity of water vapor in different parts of the pores.

O.V.Shapovalova experiments have proven that vapor moisture, condensation, can be absorbed by plant roots.

Moisture has the greatest mobility that can prolong hydrostatic pressure and move in an interval of up to a minimum moisture capacity (EKNS) full of capillary pathway. When moisture is lower than the refractive moisture (EKNS) of the capillaries, the movement of moisture is not capillary, but mainly due to the action of sorption forces. When the soil moisture is below the EKNS, the movement of moisture in a liquid state stops.

For the pelvis, all the described forms of moisture are important, but their role is different. The basis of underground irrigation is Capillary moisture. Hence the absorption of irrigation (V.G.By Korenev) methods, soil moistening is carried out in a capillary method based on the suction power of the soil. With pressure irrigation methods, the distribution of moisture under the influence of hydrostatic gravity plays an important role.

B.B.Shumakov and A.A.Alexashenko believes that when long-term pressure irrigation is carried out, the water does not have time to be evenly distributed according to the capillary properties and is absorbed into the deep layers of the soil. The feature of the TOS is that in order to keep moisture close at the norm level at the boundaries of the given contour along the entire length of the humidifier, it is necessary to set the watering rate, for which it is necessary to study the laws of the formation of moisture contours and develop reliable and effective methods of determining the parameters of moisture transfer. In order to solve this problem, scientists from the Bukhara Institute of Natural Resources Management have conducted and are conducting research on the determination and establishment of the main indicator values of moistening irrigation from under the soil.

The purpose and function of the research work. Determination of the optimal size and values and area of application of nablab irrigation from under the soil.

Setting the depth of the installation of the soil humidifier pipe; setting the pressure of the water supplied for humidification; determining the diameter of the humidifier; determining the amount of water passing through the humidifier pipe, taking into account the natural moisture content of the soil; determining the humidification limit (combing diametric and rising height) of the moistened toilet.

To carry out research work , boorish took an area of size: 5 m tall and 5m wide from the territory of the institute and prepared to plant it. In the proposed method, the pressure of water is constant, with an average value of 1.4 m.s.u. makes up the. Water moves through this pressure.

**In research work, it was determined that:**

1. The depth of installation of the soil moisturizing pipe. The free-range areas of Bukhara region are saline , this area is washed 2-3 times a year using water. In this case, an average of 1500 m3 of water is spent on each wash. In the soil layer (30-50 cm from the surface of the earth)as a result of perennial saline washes a solid layer of 30-50 cm thick was formed. Given that taking, the depth of installation of the soil moisturizing pipe is 50 cm received.

2. The diameter of the humidifier. D=4 of the diameters of the humidifier study in cases where mm, d=5 mm, d=6 mm and d=7 mm work was carried out.

3. The limit of hydration in moistened soil. It defines a limit of. it was determined using a special device (Figure 1). Device composed of: triptych (Column) 1, water tank 3, water container fixing device 2, increase the amount of water or reducing (adjusting) device 4, water diverter tube 5, humidifier 6 and transverse of the moistened layer cut 7.

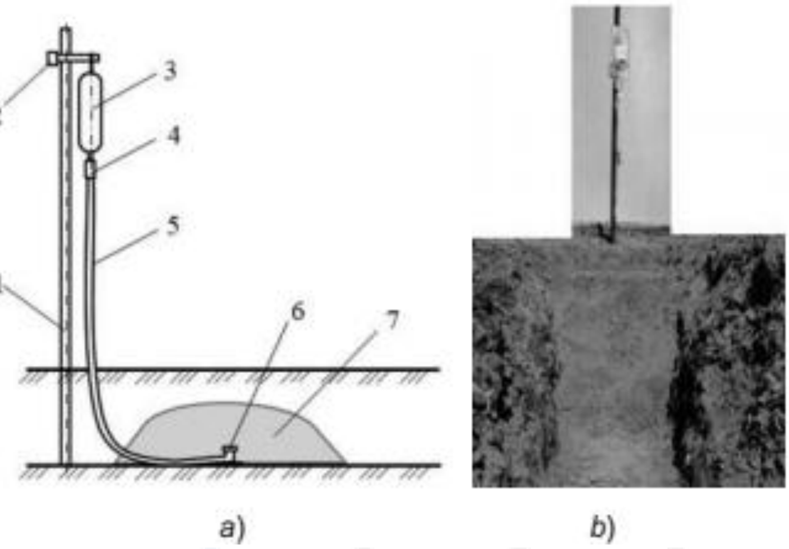


**Figure – 1. Humidifier construction**

a - general view of the structure, b - a picture of the setup

Size from the Institute space for field experience. A field of 10×10 dm was chosen, and this field has the soil was plowed.When the depth of the Handakni reaches 4 dm extremely hard saline soil (density average 2.5 t / $m^3$ it turned out a layer with a thickness of an average of 3.5 dm. Handak taking samples from the walls, its average density is 1.3 t / $m^3$ it turned out to be.This super hard by filling the handac with water water was observed passing through the layer. As a result of observation, this the layer practically did not pass water, while the walls of the handak absorb water gone. From this it can be concluded that the composition of the soil both the water used for washing and irrigation it does not pass through the layer. Taking into account that on top of the same layer special humidifier with a diameter of 0.4 dm having installed with the help of a tool, the handak was reburied with soil, which was compacted to the desired density the rubber water tank installed in the humidifier was choked and water was supplied from it to compact the soil. In this case, the soaking time was continued for 1 hour. After the expiration of the 1st period of time, the handak stem is moistened in order to determine the width and height of the spread of the soil opened. Pot in which the soil is soaked when the soil is opened it is shaped, and its height is equal to the radius of the bottom of 2 dm 3 dm found to be (transverse section of moistened soil

the surface is shown in Figure 2).

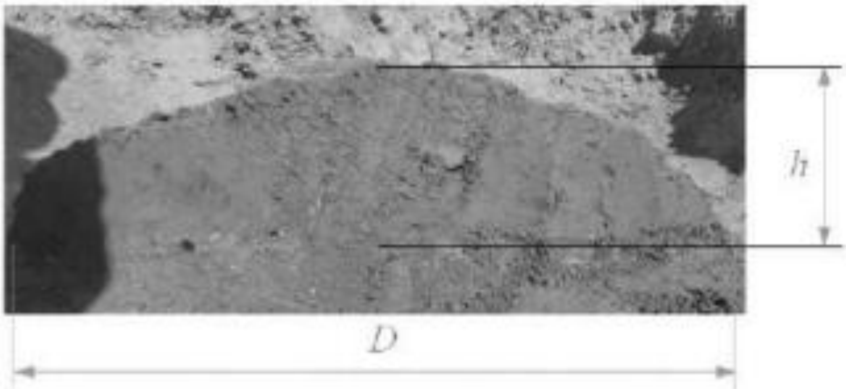


**Figure – 2. Cross-sectional surface of moistened soil**

In the same order, experiments were returned when the diameter of the humidifier was 0.4-0.5-0.6-0.7 dm. The values of the experiments obtained are presented in the table.

**Table – 1.**

**Results of conducted field pilot studies**

| | | | | |
|---|---|---|---|---|
| Diameter of the humidifier, d. dm | 0,4 | 0,5 | 0,6 | 0,7 |
| Radius of wetted soil, R. dm | 3,0 | 3,5 | 4,0 | 4,5 |
| Height of wet soil, h. dm | 2,0 | 2,5 | 3,0 | 3,5 |
| Time spent moistening the soil, hours | 1 | | | |
| The amount of water used to moisten the soil | 3,76 | 6,41 | 10,0 | 14,83 |

From the table it can be seen that the depth of moistening the soil humidifier with a diameter of 0.6 dm is 1 dm. This is the standard size. In this, the wetting height is 3 dm and the radius at the base is 4 dm. We accept these pointers to acceptable values.

Using Figure 3, the surface of the moistened soil can be determined by the following integral:

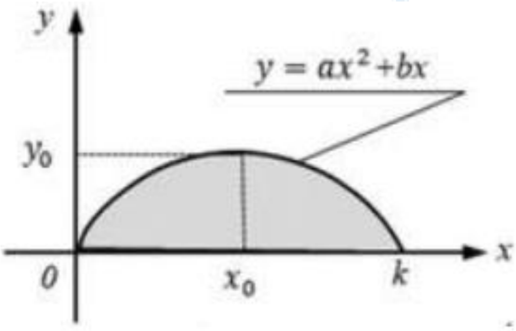


**Figure – 3. Scheme for finding the surface of wet soil**

**Conclusion:**

1. When wetting plants from under the soil, the techniques that allow plants to work are reduced to 2 times.

2. When wetting plants from under the soil, the water spent on watering is reduced by 2 times compared to traditional

3. The diameter of the humidifier is 0.6 dm between them the distance is 0.5 dm .

4. The diameter of the humidifier pipes and the distance between them it is selected depending on the conditions.

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