# WORK BASED ON SOIL-RESOURCE CONSUMPTION TECHNOLOGY

**Igamberdiev Askar Kimsanovich[1], Usmanova Gulnoza[2], Mirzayeva Shaxnoza[3]**
[1,2,3]"Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research University"

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***Abstract.*** *The article notes that during the operation of tillage machines on soils with low water retention capacity, compacted and hard layers, as a result of the interaction of the working bodies, clods with high fractional component appear on the surface of the ploughed layer. Field experiments show that a shallow tillage layer cannot retain sufficient water and moisture reserves. Soils with higher fractional content show intensive physical evaporation. Field experiments according to the specially developed scheme showed that as a result of physical evaporation soil moisture decreased by 19.39% in the 0-10 cm layer, by 21.88% in the 10-20 cm layer and by 24.05% in the 20-30 cm layer. It is recommended to use the resource-saving technology of soil tillage, which allows to preserve the moisture reserves in the soil and to reduce the losses of soil moisture by physical evaporation due to precipitation (snow and rain) in the autumn-winter and early spring period. It has been proved that it is possible to save soil moisture from physical evaporation at the level of fractional content in the surface layer not more than 5-10 mm at treatment based on resource-saving technology.*

***Keywords****: soil, irrigation, moisture, physical evaporation, reserves, technology, tillage, resource saving, topsoil, productivity.*

**Introduction**. According to the World Resources Institute, by 2040 Uzbekistan will become one of the 33 most water-stressed countries, and declining productivity will have serious negative consequences for food security and the balance of payments, which will require sustainable management of water resources and the use of resource-efficient technologies in growing crops ( Fig. 1).

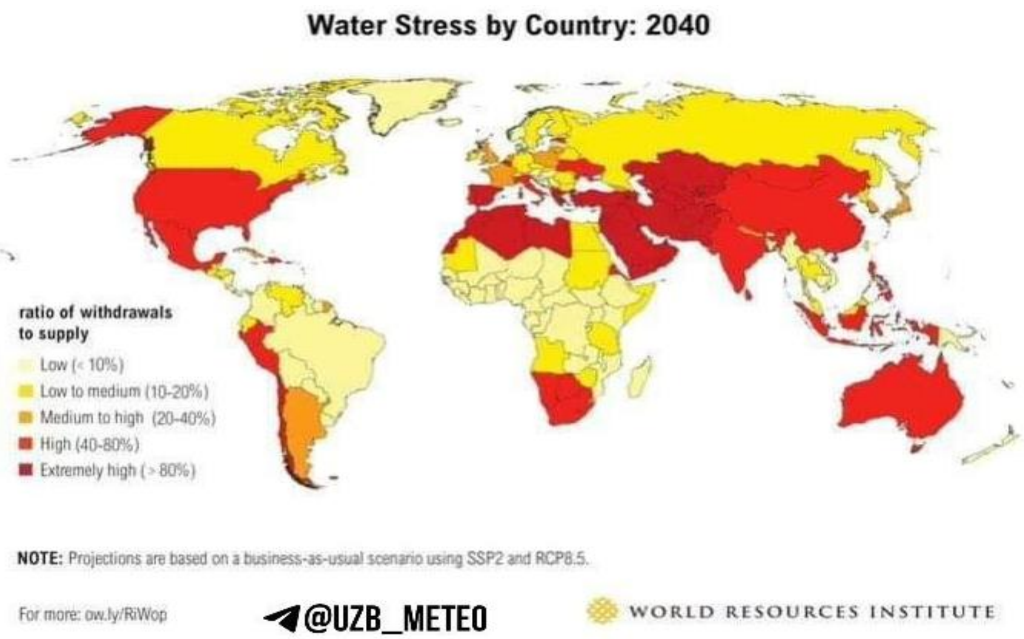



***Figure 1: Areas marked in red are countries that will suffer from water shortages by 2040.***

Therefore, the use in agriculture of Uzbekistan of drip irrigation, sprinkler irrigation, complex irrigation, “sprinkler”, mobile sprinkler irrigation system, discrete method of irrigation by leveling the land with planners equipped with laser equipment is due to rational and effective use. available water resources, crop yields can be significantly increased. The government is paying attention to improving the level.

The use of drip irrigation, sprinkler irrigation, extensive irrigation, sprinkler irrigation, mobile sprinkler irrigation system and the above-mentioned discrete irrigation method can be effective and significantly increase yield when each crop type receives sufficient water in the treated soil layer at a certain development. periods if the necessary water (moisture) is provided.

Formulation of the problem. It is known that the soils of the main agricultural crops (cotton and grains) of our Republic have different resistivity, and its value is usually in the range of 50...70 kPa in soils of sandy mechanical composition (during plowing). In dry and compacted infertile soils of clayey and heavy clayey mechanical composition, it is 90...100 kPa and higher. The lowest values (30...50 kPa) correspond to light sandy gray soils, hydromorphic and desert zone soils. In turn, humidity, density and hardness of the soil affect the formation of the size fractional composition in the surface layer when processed with working tools [1].

Soil moisture is one of the main indicators of its agrophysical condition. It is the moisture reserves in the soil that determine the level of productivity [2, 3, 4]. Therefore, to significantly increase crop yields in irrigated agriculture, it is important to rationally and effectively moisten the soil using water resources, as well as maintain sufficient moisture in the subsoil during the period of crop development. The relevance of the issue lies in the fact that in areas with deep groundwater, hot and windy areas, it is necessary to wisely use water resources, ensure sufficient moisture in the subsoil layer, and significantly increase the productivity of agricultural crops. Due to high temperatures and strong winds, the arable layer of such lands experiences rapid evaporation of moisture and it becomes very dry. It is also necessary to pay attention to the fact that a shallow plowed layer and deep uncultivated soil between crops cannot retain sufficient supplies of water and moisture and cannot create a normal water-air and nutrient regime in the root propagation environment [1].

According to the analysis, the water reserve in the arable layer of soil of fields plowed in the fall was 1250 $m^3$ per hectare, and in the arable layer of land not plowed in the fall - only 450 $m^3$ [5].

Finely tilled soil cannot retain sufficient supplies of water and moisture, so in a short period of time the crop between rows dries out and the moisture is lost. Under such conditions, as a result of repeated cultivation of row spacing to a depth of 16 cm in May-July, lumps with a high content of aggregates are released, which leads to the rapid physical evaporation of all moisture from the soil due to high temperature. air and again until the standard humidity required for the crop is depleted, i.e. irrigation [6].

In order to grow agricultural crops on the basis of resource-efficient innovative technologies, such a problem can be solved by using technologies that preserve moisture in the soil and techniques that ensure resource efficiency, using water resources wisely and efficiently.

Research method. It is effective and economical in conditions where intensive physical binding of moisture occurs in the size of the solid fractional composition when working with a tool on soils with insufficient moisture in the driving layer, with high density and hardness, falling during the autumn-winter and autumn-winter periods. early spring (snow-rain). Resource-saving technology, which collects moisture reserves in the soil due to precipitation, reduces moisture loss in the soil, and high-quality soil cultivation methods make it possible to rationally and efficiently use available water resources and significantly increase the productivity of agricultural crops.

If the arable soil layer has sufficient reserves of water (moisture) necessary for certain periods of development of each type of agricultural crop, drip irrigation, extensive irrigation, “sprinkler”, mobile sprinkler irrigation system, discrete irrigation method will be effective and with high yields. This result is due to the fact that the size of the fractional composition in the surface layer, which leads to physical evaporation and loss of moisture in the soil during processing using resource-saving technology, allows maintaining a sufficient supply of water and moisture in the soil. driven layer of soil, creates a normal water-air and nutrient regime in the root propagation environment, ranges from 5-10 mm, inevitably achieved with small sizes [7].

High-quality deep tillage with the help of technical means based on technologies that increase the water supply of the soil in shallow sown areas that are not capable of maintaining sufficient water and moisture reserves, on dry land plots that have avoided moisture and between rows, increases watering stored in the arable layer and removes salinization of saline layers . The soil of the compacted layer after the arable layer also softens, water permeability improves, harmful salts are washed out, and it becomes difficult for salts from the lower layer to rise to the soil surface [Monograph by Igamberdiev, Khalikova].

Results. Field studies examined a dry, moisture-drained crop that is unable to retain sufficient reserves of water and moisture, shallow (up to 16 cm) soil between rows, and the appearance of large lumps as a result of processing with a cotton cultivator. and results were obtained confirming the expressed opinion (Fig. 1).

***Figure 1. Aggregate composition of cultivated soil between cotton rows***

For this purpose, a special scheme for a full-scale experiment to measure work has been developed.

In field studies along the cross-section profile of a cotton cultivator between the rows of crops in the center, left and right parts of the cotton plant, in sections A, B, S, D, E, on average, large (size more than 50 mm) at distances of 18-20 cm) fractional values are distinguished the contents of the sections were determined with a measurement accuracy of 0.5 cm (Fig. 2).

According to the results of the field research, the values of the large fractional composition of the soil fragments were processed by the method of mathematical statistics, the average value (Fragility) and the standard deviation of the dimensions of the fragments (±s) were determined (Table 1).

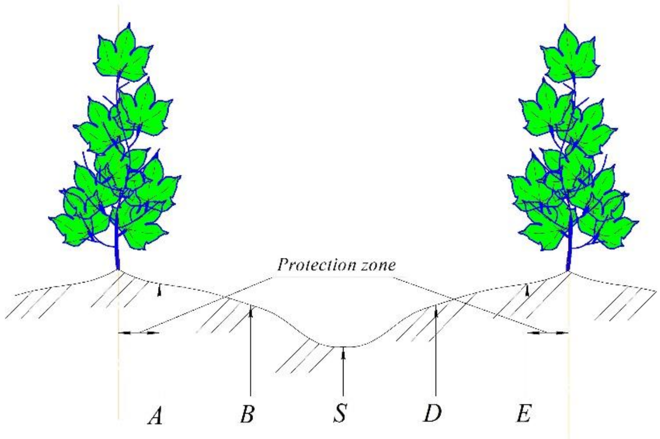



***Figure 2. Scheme of a special field experiment to study the size of large weeds between rows of crops treated with a cotton cultivator***

***Table 1***

***Results of cross-sectional study of row spacing***

| Values | Yield of large cuts by sections, in % | | | | | Overall, % |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | |
| After the first cultivation | | | | | | |
| $M_{ўр}$ | 2,56 | 1,61 | 1,71 | 1,80 | 2,52 | 10,2 |
| ±σ | 2,50 | 1,41 | 0,84 | 0,68 | 2,46 | 1,57 |
| After the second cultivation | | | | | | |
| $M_{ўр}$ | 3,17 | 2,3 | 0,87 | 1,65 | 3,14 | 11,13 |
| ±σ | 2,56 | 1,10 | 0,66 | 1,22 | 2,46 | 1,6 |

According to the results of the research, it was determined that the unevenness of the profile between the crop rows in terms of transverse and longitudinal profiles is also the release of large lumps under the influence of cultivator tools, that is, the values have a variable character according to the field research scheme.

***Figure 3. The coarse aggregate content of the soil when processed***

The results of the field research are summarized and the analysis of the data shows that in all the studied cases, the soil between the crop rows was drained of moisture, the traces of the water drained were hardened, especially in the medium and heavy mechanical composition soils, such cases were observed more often, large lumps (larger than 50 mm) appeared during processing. confirmed (figure 3).

In the process of researching transverse and longitudinal profiles between crop rows, moisture values of soil layers were also studied according to a specially designed field experiment scheme (table 2).

***Table 2***

***Cotton inter-row soil moisture by sections research results***

| Indicators | Cuts | Moisture by soil layers, % | | |
|---|---|---|---|---|
| | | 0…10 см | 10…20 см | 20…30 см |
| Moisture, % | Before processing/after processing | | | |
| | А | 7,9/6,2 | 9,1/7,3 | 14,6/9,3 |
| | Б | 9,8/7,9 | 12,6/9,8 | 14,1/11,2 |
| | С | 11,6/8,8 | 13,4/10,5 | 15.4/12,3 |
| | Д | 9,9/7,8 | 11,7/9,1 | 13,1/11,3 |
| | Е | 7,2/6,7 | 9,4/7,2 | 13,9/9,3 |
| | Average | 9,28/7,48 | 11,24/8,78 | 14,22/10,80 |
| Evaporation of moisture loss, % | | 19,39 | 21,88 | 24,05 |

At the same time, soil moisture indicators were studied on transverse and longitudinal profiles between rows of crops before and after treatment with a cotton cultivator.

Soil moisture values were determined as a result of data processing using the method of mathematical statistics [43; pp. 1-5].

The results of table 2 show that moisture content increases with increasing soil layer, and rapid moisture loss occurs after treatment. It has been confirmed that the decrease in moisture content occurs due to rapid evaporation in large lumps and voids formed after tillage.

Today in agriculture, cotton cultivation is carried out between rows using feeding cotton cultivators of the types KRKH-3.6, KRT-4, KRKH-4 and KHU-4A, KKhO-3.6/4.2 and KKhO-5, 4 [7]. There are 2.4 such cultivators in areas sown with 4-, 6- and 8-row seeders with row spacing of 60, 70 and 90 cm; 2.8; 3.6; The working width is 4.2 and 5.4 meters, the working bodies are adjustable in the working depth range of 30-200 mm and are used for weeding, tillage and fertilization.

Important agrotechnical requirements for high-quality soil tillage before planting or between rows are important agrotechnical requirements for maintaining soil moisture, releasing a small amount of wet layer onto the soil surface, and pruning foreign plants.

The observation results confirmed that the cotton growers used on farms do not fully meet agrotechnical requirements [7].

Using the above technical means, the formation of a fractional composition with large lumps was observed due to soil moisture less than 8-11 percent and hardness of about 1.6-2.0 MPa during inter-row cultivation.

In order to assess the quality of soils, field studies were carried out using a cotton cultivator and inter-row processing of cotton.

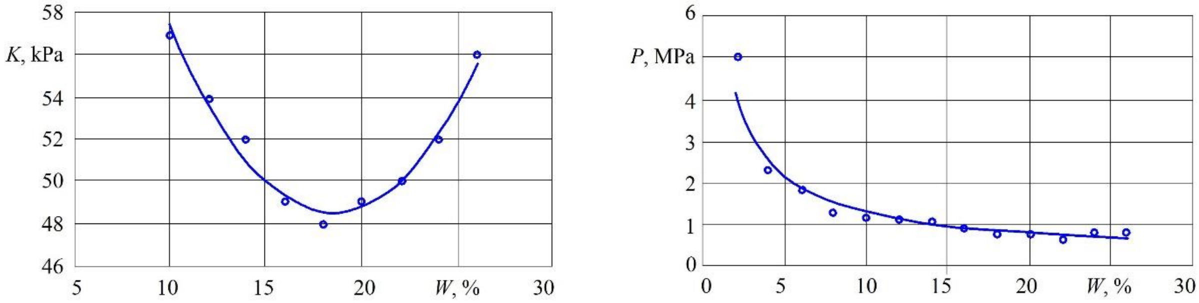
The results of field studies showed that the friction content of lumps larger than 50 mm was 25.4% with a single treatment and 11.6% with a double treatment (Table 1).

***Table 1***

***The degree of compaction of cultivated soil between cotton rows***

| | Number of treatments, times | Amount of mm-sized fractions,% | | | |
|---|---|---|---|---|---|
| | | >50 | 50-25 | 25-10 | 10> |
| 1 | Once | 25,4 | 41,6 | 20,2 | 12,8 |
| 2 | Twice | 11,6 | 37,5 | 37,6 | 13,3 |

In field experimental studies, the penetration of the cotton cultivator into the soil, the level of soil compaction due to the impact of working tools, and the resistance of working tools to traction (drag) were studied. The analysis of the obtained research results showed that the specific resistance to traction of working tools is higher when the soil moisture level is low. As a result of processing the data obtained from a large number of field experimental studies, empirical relationships representing the effect of soil moisture on stiffness and specific resistance were established (Fig. 4).




$$K = 0{,}1255W^2 - 4{,}6361W + 91{,}316 \qquad P = 6{,}7536 \cdot W^{-0{,}7096}$$

***Figure 4. Graphs of soil resistivity (K) and hardness (R) versus moisture content (W)***

The analysis of the given data showed that soil moisture loss due to physical suffocation during processing depends to a large extent on the smoothness of the processed surface. The results of the study confirmed that the size of the fractional composition of the soil also has a certain influence on the loss of moisture (Fig. 5).

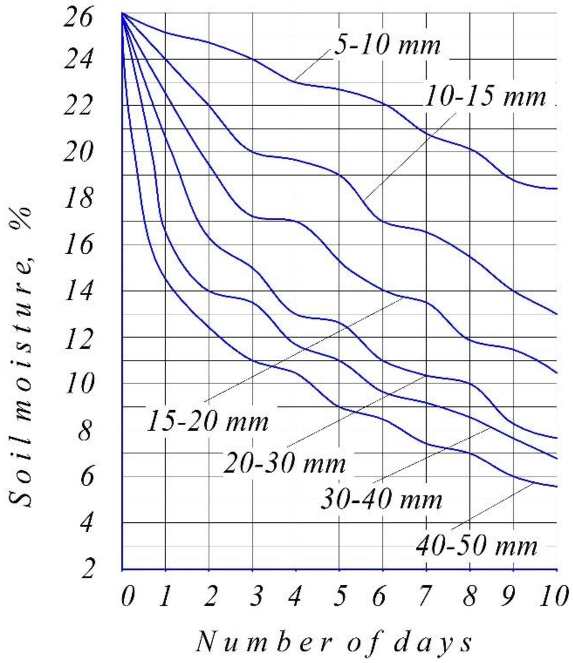



***Figure 5. Soil fractional content dimensions physical moisture in it graphs of effects on evaporative loss***

According to the analysis of the research results, moisture loss due to physical evaporation in the soil over 10 days, depending on the size of the fractional composition in its surface layer, had the following values: physical evaporation and moisture loss by 5 - 10 mm are 29.6%; Physical evaporation and moisture loss to a depth of 10 - 15 mm are 50.0%; Physical evaporation and moisture loss at a depth of 15 – 20 mm is 59.6%; Physical evaporation and moisture loss at a depth of 20 – 30 mm are 70.3%; Physical evaporation and moisture loss at a depth of 30 – 40 mm are 73.8%; Physical evaporation and moisture loss at a depth of 40 - 50 mm is 78.4%..

**Conclusions.**

In the process of working with the working tools of the agricultural machine, the humidity, density and hardness of the soil affect the formation of lumps with a large fractional composition on the surface of the driving layer. In addition, the shallow cultivated soil layer cannot retain enough water-moisture reserves, it becomes dry and moisture-evaporating in a short period of time.

When working with working tools on soils with insufficient moisture of the driving layer, high density and hardness, intensive physical moisture binding occurs in the dimensions of solid fractional composition.

Resource-saving technology that does not require a small amount of money, accumulates moisture reserves in the soil due to precipitation (snow and rain) in the autumn-winter and early spring periods, reduces the loss of soil moisture, and the method of high-quality soil treatment is effective in the rational and efficient use of water resources.

In the field studies carried out according to the specially designed field experiment scheme, 19.39% in the 0...10 cm layer, 21.88% in the 10...20 cm layer and 24.05% in the 20...30 cm layer physical suffocation loss of moisture has been determined.

The results of all conducted field studies show that the fractional composition of the surface layer causes the physical evaporation loss of moisture in the soil when processed on the basis of resource-efficient technology that can maintain sufficient water-moisture reserves in the soil driving layer itself, creates a normal water, air and nutrient regime in the environment where the roots spread. confirmed that it can be achieved when the dimensions are not larger than 5-10 mm.

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