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IMPROVING TECHNICAL AND TECHNOLOGICAL ELEMENTS OF COTTON DRIP IRRIGATION THROUGH EFFECTIVE USE OF LAND AND WATER RESOURCES

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Abstract: Based on the conditions and processes in the cotton fields of our country, the amelioration condition of the soil and the correct distribution of water resources are the main criteria for preparing the fields for drip irrigation. If the use of water-saving irrigation technologies is one of the important factors in increasing productivity, then moderate and high-quality irrigation of cotton is important for obtaining a bountiful harvest of cotton. Thus, in this situation, there is a need to develop optimal irrigation methods using drip irrigation. For this, correct phenological observations, proper organization of the irrigation system, improvement of technical elements of drip irrigation, and control of the level of runoff water are the main criteria. In general, in drip irrigation of cotton, the correct selection of the lengths of irrigation hoses and the slopes of the plot, which are one of its technical elements, is of great importance. Therefore, in today's global water shortage environment, the use of such water-saving technologies is an indispensable tool in agriculture and water management.

Key words: The method of double planting, use of stimulants in cotton, drip irrigation rate, biological phytohormones, fotosintez fotosintez, chdns (marginal field wet capacity), hydromodule.

Introduction. The main issue in agriculture is the continuous improvement of soil fertility.

To correct the situation, it is necessary to develop and implement new innovative technologies for the use of land and water resources. It is necessary to widely use water- and resource-saving agrotechnologies in cotton cultivation.The Republic of Uzbekistan's Concept of Water Resources Development for 2020–2030 was created on July 10, 2020. The Republic of Uzbekistan's Concept of Water Resources Development for 2020–2030 states that drip irrigation will be used on 600,000 ha of the 2 million hectares that would be covered by water-saving technologies. The expected annual water savings of 35–40% (3.5–4 billion m3) is 298 thousand hectares. It is conceivable to remodel some land that cannot be currently used [1].

Analytical predictions state that out of the 7.5 billion people living in the globe now, about 1.1 billion experience water shortages. As a result of the population migration to the arid regions of the country, there is an increasing need for and focus on the widespread usage of drip irrigation systems in the countries applying water-saving irrigation technologies, including Uzbekistan as the largest cotton producer [2].

According to the decision, from 2022, to cover part of the costs of introducing irrigation technologies, including cotton fields per hectare of drip-irrigated cropland - 8 million soums (in cotton fields in the Republic of Karakalpakstan and Khorezm region subsidies in the amount of 12 million soums will be given for introduced drip irrigation systems. In 2022, 1 trillion 182.4 billion soums will be allocated from the republic budget to support the introduction of water-saving

technologies. According to the decision, a single electronic register of "Tomchi-reistr" contract enterprises will be developed. [3].

In our republic, special attention is paid to the efficient use of water-saving technologies, especially the drip irrigation technology, and the cultivation of crops. According to the Decree of the President of the Republic of Uzbekistan. № 6024 dated July 10, 2020 "On approval of the concept of water management development of the Republic of Uzbekistan for 2020-2030" water-saving irrigation in our country until 2030, the areas where technologies are used will be 2 million per hectare, according to the Decision. № 5005 dated February 24, 2021 "On approval of the strategy for the management of water resources and development of the irrigation sector in the Republic of Uzbekistan for 2021-2023", the drip irrigation system is in place the task of rapidly expanding cultivated areas and reaching 800,000 hectares in 2023 has been set [4].

Research method. The method of carrying out the work was carried out in the field, phenological observations were carried out based on Agrotechnology of care of cotton varieties planted in Fergana region "Methods of conducting field experiments". Development and implementation of scientifically based effective systems of crop rotation. The advantages of growing cotton at 60 cm row spacing and planting the seed in the "Pair line up" method, introducing cotton drip irrigation technologies. The technologies of using stimulants in cotton are considered.

Research results. The area of plant nutrition is more at 60 cm row spacing and creates favorable conditions for the growth and development of cotton. When the seed is planted in a 60 cm scheme, cotton yield increases by 10-12 s/h compared to a 90 cm scheme. In this case, the microclimate between cotton rows improves. The air temperature of the environment where cotton is located is almost the same when measured in the early morning between 60 and 90 cm rows at a height of 100 cm from the ground. However, during June, the temperature between the 90 cm cotton rows will be 0.4-1.2 oC warmer than the 60 cm rows. So, when cotton is grown at a row spacing of 60 cm, the microclimate in the fields is favorable and accelerates the growth and development of plants.

When irrigating cotton once, 1000-1100 m^3/ha of water is consumed between 90 cm rows, and 760-880 m3/ha between 60 cm rows. That is, 18-23% of water is saved due to intercalating irrigation in 1-3 irrigations when grown in a row spacing of 60 cm. When cotton is grown in a row spacing of 60 cm, the productivity increases by 3-5 s/ha or 10-15% compared to the crop grown in a row spacing of 90 cm.

Moderate and high-quality irrigation of cotton is important for obtaining a high yield of cotton. Because, when the plants in each hectare produce 1-2 leaves, 10-12 m^3 per day, 30-50 m^3 during flowering, 80-90 m^3 during flowering and fruiting, some varieties even 100-120 in some soils. m^3, 30-40 m^3 of water evaporates (transpiration) during the opening of the pores. In the initial period, cotton grows rapidly and is prone to rotting.

Table 1

Terms and norms of watering cotton

Gray soil region

№	Hydromodule mist	Irrigation scheme	Seasonal watering rate	Irrigation period	
				Start	End
1	II	2-4-1	6200	16.V	10.IX
2	III	2-4-0	5900	21.V	31.VIII
3	V	2-3-0	4400	26.V	25.VIII

4	VI	2-3-0	5300	16.V	10.IX
5	VIII	1-2-0	3000	1.VI	20.VIII
6	IX	1-3-0	3800	11.VI	31.VIII

Desert region

№	Hydromodule mist	Irrigation scheme	Seasonal watering rate	Irrigation period	
				Start	End
1	II	2-5-1	6700	6.V	5.IX
2	III	1-4-1	6400	26.V	31.VIII
3	V	2-3-0	4800	26.V	25.VIII
4	VI	1-4-0	5800	16.V	25.VIII
5	VIII	0-3-0	3200	11.V	20.VIII
6	IX	0-4-0	4200	11.V	25.VIII

Irrigation norms are determined depending on the soil-climatic conditions of the region, the level of agrotechnics and the biological characteristics of the planted crop. At present, the practical manual "Hydromodule division into districts and the regime of agricultural crops in Fergana region" developed by the "Union cotton" Scientific and Production Association in 1986 is used to determine the water regime of agricultural crops. Table 1 shows the irrigation terms and standards of cotton in hydromodular districts of Fergana region under different soil and climatic conditions.

Table 2 shows the average seasonal irrigation rates when cotton is irrigated by these method

Table 2

Seasonal irrigation norms when irrigating cotton with different irrigation methods

Indicators	Unit of measure	Pre-watering	Drip irrigation method	Method of watering by mulching with polyethylene film	Discrete method	The method of interrow irrigation
Seasonal watering rate	thousand m^3/ha	5,5	2,75	3,0	5,0	4,5

As a result of using the technology, water consumption is reduced by 45-50%, the efficiency of mineral fertilizers increases, application rates are reduced by 40-45%, cotton yield increases by 12-15 s/h.

In the conditions of semi-hydromorphic and automorphic soils with a heavy mechanical content of seepage water level at a depth of 2-3 meters and an automorphic soil with a seepage water level deeper than 3 meters, during the growing season, in accordance with the development phases, the calculation layers of the soil are 50-50-50 in drip irrigation technology. cm, the water consumption in the drip hoses is 1.0-1.2 l/hour, in which irrigation of early cotton varieties compared to Boundary field moisture capacity is 75-75-70% at pre-irrigation soil moisture of 2-4(5)-2 system, irrigation interval 8-9 times in 10-11 days, medium-ripe cotton varieties compared to Boundary field moisture capacity at 70-70-60% pre-irrigation soil moisture, 2-4(5)-2 system, the irrigation interval is 8-9 times in 10-12 days, and in soils with a light mechanical composition,

cotton varieties of quick-ripening cotton are grown at 75-75-70% pre-irrigation soil moisture 3(4) compared to Boundary field moisture capacity. In the 6(7)-3 system, the irrigation interval is 12-14 times in 5-6 days, in the pre-irrigation soil moisture of 70-70-60% of mid-season cotton varieties compared to Boundary field moisture capacity, In the 5(6)-2 system, watering 10-11 times in 8-9 days is recommended.

Dynamics of groundwater table depth and mineralization in the experimental field

To monitor the dynamics of groundwater level fluctuations, two observation wells were installed, and systematic observations were conducted throughout the growing season.

Based on the observations conducted in 2022, it was observed that the groundwater level in the control variant was at a depth of 1.74 m at the beginning of the growing season and reached 2.25 m by the end of the period; in the experimental variant, the level was 1.60 m at the beginning and changed to 2.40 m by the end of the season.

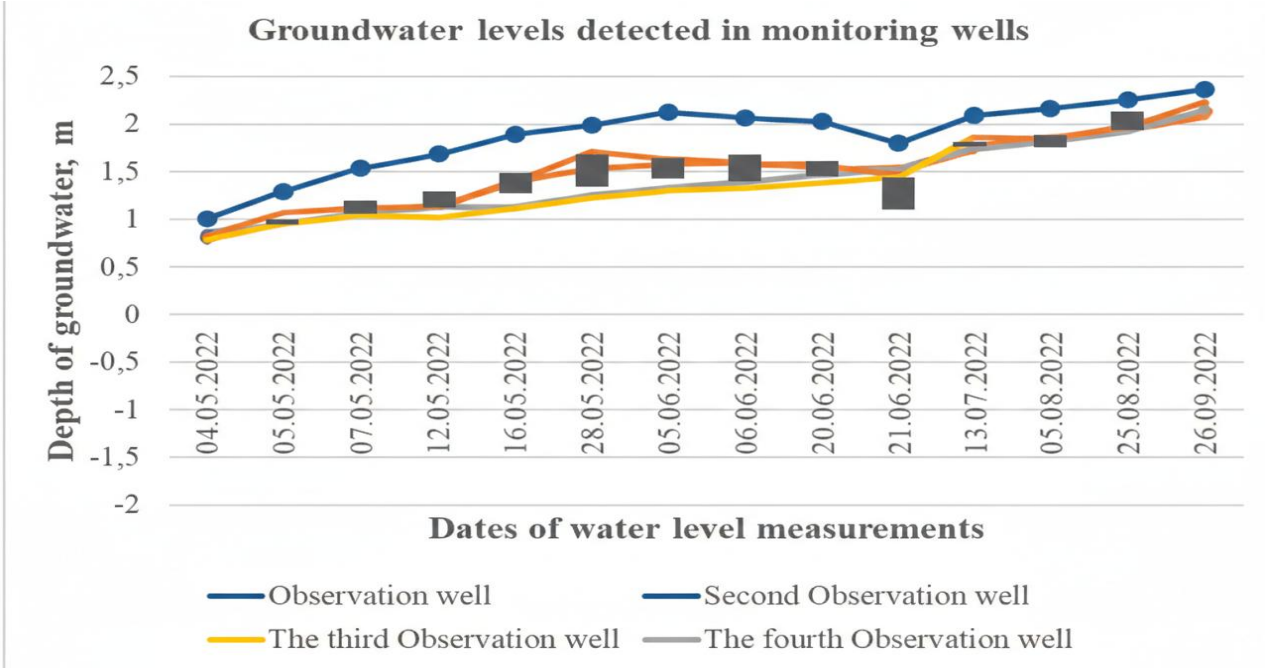


Figure 1. Change in groundwater levels during the vegetation period, metres.

Soil Porosity Dynamics Under Different Irrigation Methods

A slight decrease in soil porosity was observed in the arable layer across all variants due to the impact of field preparation, cotton sowing, inter-row cultivation, furrowing, and irrigations carried out during the growing season.

- At the end of the 2023 growing season: In the 0–30 and 0–50 cm layers of the furrow-irrigated control variants (1st experiment), soil porosity was 48.2–47.4%, whereas in the drip-irrigated experimental variants, this indicator was 48.7–47.8%.
- At the end of the 2024 growing season: In the 0–30 and 0–50 cm layers of the furrow-irrigated control variants, soil porosity was 48.2–47.4%, while in the drip-irrigated experimental variants, it amounted to 48.65–47.8%.

A relatively higher soil porosity (by **0.5–0.4%**) was observed in the drip-irrigated experimental variants.

Table 3
Comparative Soil Porosity (%) at Vegetation End

Year	Irrigation Method	0–30 cm Layer	0–50 cm Layer
2023	Furrow (Control)	48.2%	47.4%
	Drip (Experimental)	48.7%	47.8%
2024	Furrow (Control)	48.2%	47.4%
	Drip (Experimental)	48.65%	47.8%

Additionally, at the end of the 2023 growing season, it was observed that soil porosity in the lower 0–70 and 0–100 cm layers was 46.4–45.0% in the furrow-irrigated control variant, while in the drip-irrigated variants, this indicator was 46.9–45.6%; in 2024, soil porosity in the 0–70 and 0–100 cm layers was 46.4–45.0% in the furrow-irrigated control variant, while in the drip-irrigated variants, this indicator amounted to 46.9–45.6%.

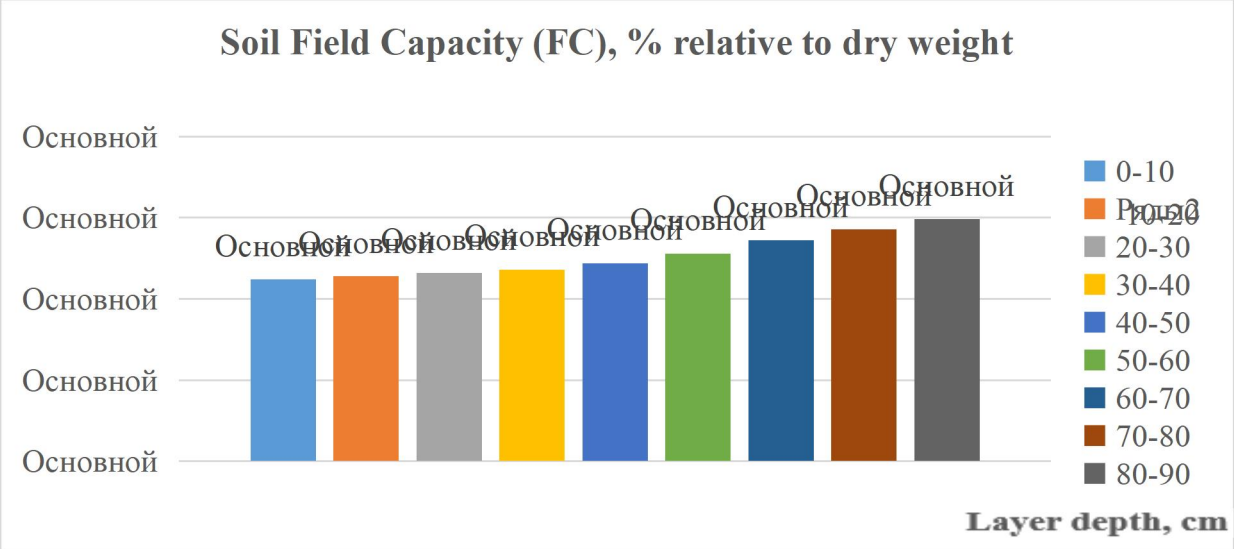


Figure 2. Soil field capacity (FC), % relative to dry weight

The field capacity (FC) or water-holding capacity of the soil in the experimental fields is characterized by its ability to retain the maximum amount of water within the capillaries of the soil layer in an immobile state for a significantly long period, without it draining into the lower layers.

Field capacity primarily depends on the soil's particle-size distribution, structure, and density. The field capacity of the soil is an important indicator in determining irrigation timing and norms. For this purpose, the field capacity of the experimental field soil was determined (Figure 2).

The field capacity of the experimental field soil relative to its absolute dry mass was 11.6% in the 0–30 cm arable layer, 12.2% in the 0–50 cm layer, 14.3% in the 0–70 cm layer, and 14.9% in the 0–90 cm soil layer.

Conclusion

The data presented above show that the use of drip irrigation technology can be used in semi-hydromorphic and automorphic non-saline, low and moderately saline areas where the water table is at a depth of 2-3 meters and below 3 meters. it works well. When the drip irrigation method is used, cotton should be watered more often and less frequently than in the case of direct irrigation. Cotton is irrigated 8-10 times in non-saline and low-saline areas, and 10-12 times in moderately saline areas. 250-300 m^3/ha is used for each irrigation, and 2800-3200 m^3 of water during the season. In soils with a light mechanical composition (sandy, loamy) and high water permeability, and in areas prone to salinity, the water rate is set 5-10% higher. In addition, irrigation rates will be reduced by 12-15% in the lands where the groundwater level is close (1.5-2.0 m). It is sufficient to moisten the 0-50 cm layer of the soil during drip irrigation of cotton. Since the cost of the drip irrigation system is relatively high, it is important to properly plan its use. If planning is poorly defined, it will lead to improper use of the system, and the profit may decrease without recouping the costs.

In order to prevent this from happening, it is necessary for managers of farms and agroclusters, water management experts to learn the technology of drip irrigation of cotton and strictly follow the requirements of the drip irrigation system.

In addition, the mineralisation of groundwater was determined using an electrically conductive metre at the beginning, middle and end of the vegetation period. Analysis of the obtained data shows that the mineralisation of groundwater increased slightly from the beginning to the end of the vegetation period. The dynamics of groundwater salinity continued to change throughout the year.

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