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<https://doi.org/10.61796/ejheaa.v1i10.971>**DEVELOPMENT OF A SCIENTIFICALLY BASED
IRRIGATION REGIME****Matyakubov, B.Sh**

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Abstract: At the time of year-to-year global climate change, and taking into account the water demand of cotton grown in the Bukhara region in order to prevent the decrease in productivity and quality of agricultural crops due to the lack of irrigation water compared to the crop demand, the method of seasonal irrigation using the data of the weather station. using CropWat 8.0. Based on the program, the coefficient values for the development stages of cotton were adopted based on the mechanical composition of the soil, the depth and mineralization of seepage waters. The results of scientific research carried out by scientists in cotton fields were analyzed in Kham

Keywords: Bukhara, cotton, light soil, medium soil, drip irrigation, technology



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Introduction

Rising air temperature, increasing population, rational use of water resources, economical use of water in agricultural crop cultivation, and the use of drip irrigation, which is considered an economical method of irrigation, are all becoming increasingly important as a result of global climate change. Currently, "... 2.0 % of the available water resources on the globe are fresh water reserves, 79 % of which are permafrost, 20 % groundwater and 1.0 % lake and river water, which is very scarce for human needs" [19, 23]. In this regard, special emphasis is placed on the importance of developing technologies that save water resources, are simple to use, and are adapted to the water economy in order to increase agricultural crop productivity and quality[1].

The application of cutting-edge water-saving irrigation technologies, specifically drip irrigation, remains one of the most pressing issues in agricultural crop cultivation around the world.

The FAO methodology's "CropWat-8.0" program is used in most developed countries around the world, including the United States of America, Israel, France, China, Turkey, and Germany, to improve the elements of drip irrigation techniques and to develop constructions that meet the requirements of the new era, simplify them, and determine the plant's water demand. [15, 20, 21, 24].

In the Republic of Uzbekistan, irrigation water is in short supply, the application of water resources-saving irrigation technologies is the most important and urgent task in the cultivation of high and quality crops from agricultural crops, especially cotton. Our country's President and government are paying close attention to this issue. Today, comprehensive reforms of resource-saving irrigation technologies are being carried out in our republic in order to mitigate the negative consequences of water shortage in agricultural crops cultivation [1, 9, 17, 18].

The current state of the problem under consideration Researches aimed at improving drip irrigation technologies in our republic: V.A. Dukhovnyy, M.G. Horst, Yu.G. Sheynkin, A.V. Novipkova, Z.I. Tsoi, M.A. Pinkhasov, S.N. Ryzhov, M.P. Mednis, K.A. Akhmedov, F.M. Sattarov, N.F. Bepalov, R.A. Murotov, R.K. Ikramov, Q.M. Mirzajanov, F.A. Baraev, B. S. Serikbaev, A. T. Salokhiddinov, M. Kh. Khamidov, B. Sh. Matyakubov, G. A. Bezborodov, I. E. Makhmudov, A.G. Sherov, S.A. Mamatov, Yu. Esanbekov, Sh. Kh. Rakhimov, R. J. Karshiev, A. S. Shamsiev, A.K. Karimov, S.A. Nerozin, B.F. Qambarov, A. Usmanov, B. Kamilov, B.G. Mallaev, T.I. Palvanov, E.D. Cholpankulov, R.G. Scientific studies were carried out by Lyubar, U. Norkulov, G. V. Stulina, A. A. Artikov, M. M. Sarimsakov and others [2, 3, 4, 22]. And some results have been achieved. The fact that the research was conducted in the conditions of salinity-prone soils in the Bukhara region, and the fact that the optimal location of the drip irrigation pipeline, which is an element of the drip irrigation technology, was determined, is a proof of the relevance of this scientific work [7, 8, 10, 11].

Methods

The study was carried out in the field. Laboratory analysis, phenological observations of cotton, measurement, and analytical work were carried out using the methodical manuals "Methods of conducting field experiments", "Methods of studying agrochemical, agrophysical, and microbiological properties in irrigated areas of cotton" and FAO methodology. The widely accepted multi-factor method of B.A. Dosphehov, as well as methods of creating mathematical models and their numerical calculation, were used to assess the accuracy and reliability of scientific research findings.

Research on the improvement and irrigation of cotton drip irrigation technology element in the conditions of weakly saline, light and medium sandy loam soils of Bukhara region with a water level of 2.0-2.5 m., water mineralization of water 2.0-3.0 g/l development of the procedure and drip irrigation was carried out to scientifically justify the effectiveness of the technology [12, 13, 14].

The scientific innovations of the research consisted in the improvement of the layout scheme of the drip irrigation pipeline in the field, which was considered an element of the drip irrigation technology, taking into account the dimensions of the wetting contour formed in the soils with a light mechanical composition during drip irrigation and the accumulation of salt during drip irrigation. In addition, based on field research findings and FAO methodology, the optimal irrigation cotton drip irrigation method, as well as linear correlation coefficients were developed to determine the degree of correlation of evapotranspiration amounts based on various empirical formulas.

In the Bukhara region, research was conducted on the "Bukhara-6" variety of cotton included in the state register. In conducting research, the experimental area consisted of 3 options and 4 repetitions. Option 1 was done by drip irrigation, options 2 and 3 by drip irrigation.

During drip irrigation, changes in soil moisture were taken into account, according to cotton growth and development phases: 70-80-65 % (option 2) and 80-80-65 (option 3) at limit field moisture (% of ultimate field moisture capacity (UFMC)) retention is achieved.

Result and Discussion

Taking into account the dimensions of the wetting contour formed in the soils with a light mechanical composition during drip irrigation, and additionally the accumulation of salt, it was considered an element of the technology of drip irrigation - the arrangement scheme of the drip irrigation pipe in the field was improved in order to provide a comfortable water-air-food-salt regime in the active layer of the soil for light soils. That is, based on the water-physical properties of light soil, the irrigation pipes were laid not in the middle of the row of cotton, but at a distance of 7-10 cm, as in medium sand soils, and not in the middle of the row of cotton, but on the side of each row of cotton (at a distance of 7-10 cm) (Figure 1).

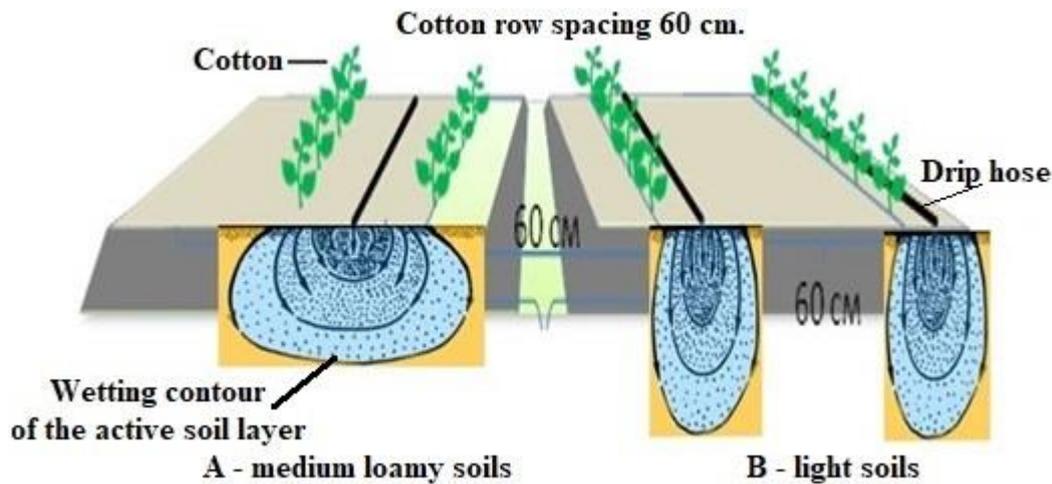


Figure 1. Scheme of improvement of drip irrigation technology element

The rates and periods of cotton drip irrigation were calculated based on the international FAO method “CropWat-8.0” program adopted for irrigation areas of the world, taking into account the natural climate and soil conditions of the farm [12, 13, 14] (Figure 2) The FAO method's drip irrigation pattern of cotton was compared to data obtained under field conditions during the experimental years. (Table 1).

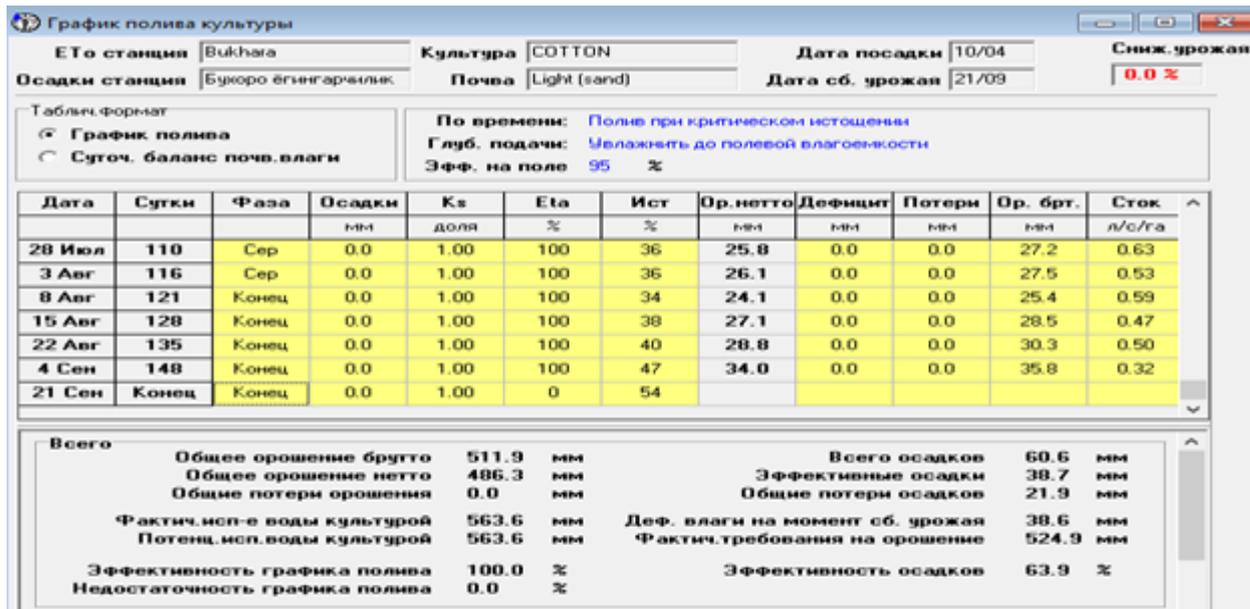


Figure 2. Determination of cotton drip irrigation regime based on the program “CropWat-8.0”

Table 1 Comparative values of the irrigation order

№	Parameters	Unit of measurement	Field experience	FAO methodology
1	Number of irrigations	units	15-18	18-21
2	Irrigation rate	m ³ /ha	180-290	230-340
3	Seasonal irrigation rate	m ³ /ha	3283-3686	4863-5015

Before irrigation of cotton, the soil moisture was 70-80-65 (percent moisture in the active soil layer before flowering-from flowering to maturity-after maturity) % in contrast boundary field wet capacity, and in option 2, the seasonal irrigation rate was 3354 m³/ha in light mechanical composition soils and 3583 m³/ha in medium sandy soils, or 1926 m³/ha, respectively, in the years of the study. m³/ha (or 36 %) and 1444 m³/ha (or 28 %) of irrigation water was saved (Figure 3).

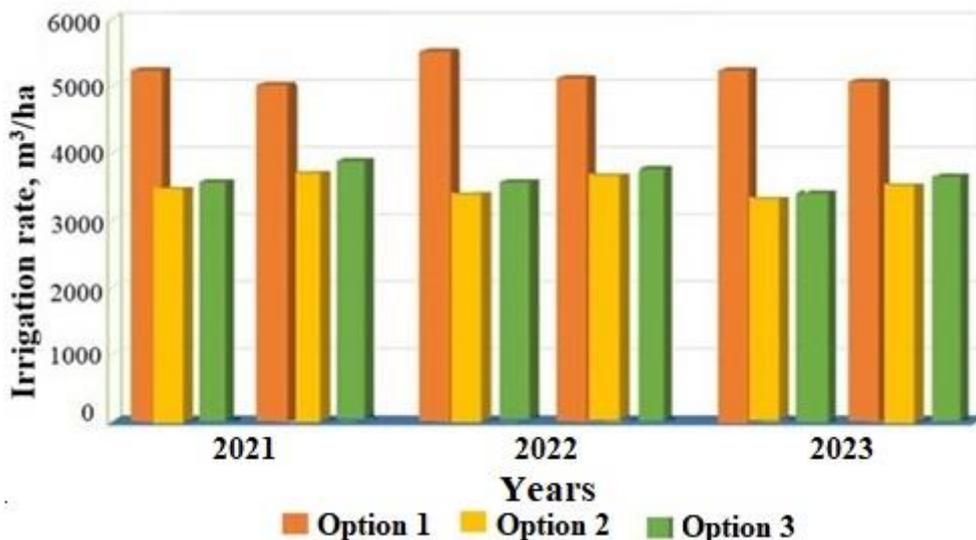


Figure 3. Cotton irrigation rate by experimental fields and options

Irrigation water saving was achieved due to the compliance of the irrigation rate with the water demand of cotton and the limitation of the wetted area. The average yield in three years of

drip irrigation of cotton was 4.16 t/ha in light mechanical content soils and 4,10 t/ha in medium sandy soils, compared to the control by 1.07 t/ha (or 34 %) and 0.88 t/ha, respectively. ha (or 27 %) more cotton yield was obtained.

The amount of total evaporation in the experimental field was calculated using the empirical formulas of Penman-Monteith, Blaney-Criddle, N.N.Ivanov, S.M.Alpatyev based on natural-climatic indicators and compared with the results of the field experiment (Table 2). Linear correlation coefficients were developed to determine the level of correlation between evapotranspiration amounts decided on the basis of various empirical formulas. The correlation coefficients were equal to $R^2=0.9384$ according to the "CropWat-8.0" model and N.N.Ivanov and $R^2=0.8967$ according to the "CropWat-8.0" model and Blaney-Criddle (Figure 4).

Table 2. Water consumption determined by different methods in the experimental plot, m³/ha

Penman-Monteith	Blaney-Criddle	N.N.Ivanov	S.M.Alpatyev	Experimental site
7048	6353	7601	5338	6061

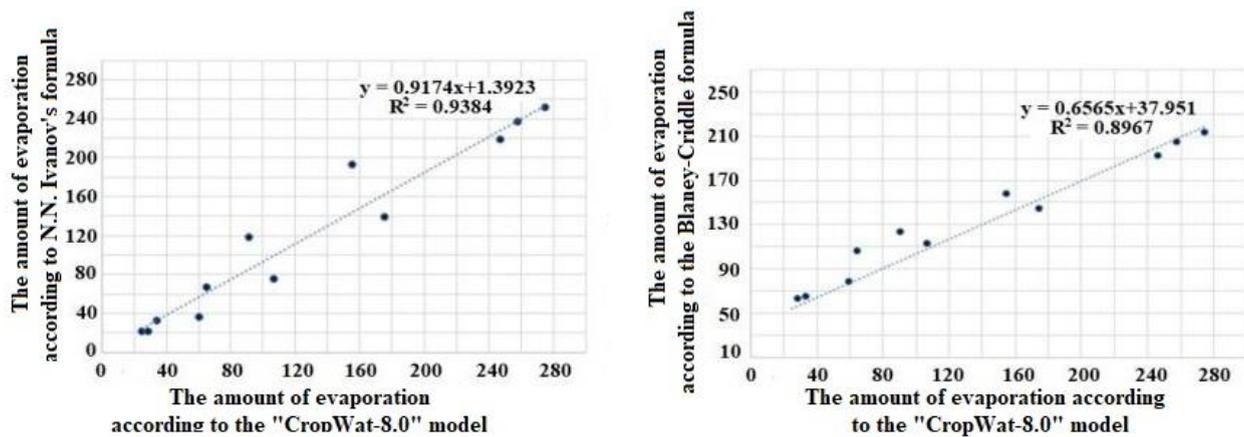


Figure 4. Correlation coefficient of evapotranspiration values.

Conclusion

Based on the research conducted, it is possible to manage the irrigation, by giving the water to the plant's roots, weed reduction has been achieved, while evaporation from the field has been reduced. Due to the uniform distribution of irrigation water across the field, there was no runoff from the field. At the same time, beneficial micronutrients from the soil were prevented from being washed away. Savings are achieved by using less water and fertilizer compared to the method of irrigation over the land. By providing optimal moisture for cotton growth and development, the average yield of cotton per hectare in three years was: - 4.16 tons in soils with light mechanical content and - 4.1 tons in medium sandy soils. Compared to surface irrigation, more cotton was obtained per hectare: 1.07 tons (on light mechanically composed soils) and 0.88 tons (soils with medium mechanical composition).

The quantity of irrigations was 18-21, irrigation rates were 230-340 m³ per hectare, and seasonal irrigation rates were equal to 4863-5015 m³. The number of irrigations is three, the irrigation standards are 50 m³/ha, and the seasonal irrigation standards are 1400-1500 m³/ha, according to the results of the field experiment.

In the experimental fields, the best economic indicators were achieved with drip irrigation, keeping the pre-irrigation soil moisture at 70-80-65 % relative to boundary field wet capacity, which is favorable to growth and development and higher yield of cotton:

in soils with a light mechanical composition, the rate of yield was 52.4 % on average in 3 years in the options irrigated with cotton, and in the experimental options with drip irrigation, this indicator was 69 %, and the yield was 16.6 % higher than the control options;

It was discovered that the yield level of cotton in the options with medium sandy mechanical composition was 54.7 % in 3 years, and in the experimental options with drip irrigation, this indicator was 67 %, profitability was 12.3% higher when compared to the control options.

4.1-4.2 tons per hectare is higher than the “Bukhara-6” variety of cotton in weakly saline soils of the Bukhara region with a water level of 2.0-2.5 m, water mineralization of 2.0-3.0 g/l maintaining soil moisture before irrigation at 70-80-65 % relative to boundary field wet capacity and:

18 times on soils with a low mechanical density, in the 4-12-2 system according to growth phases, with an average irrigation rate of 194-177-224 m³ per hectare and a seasonal irrigation rate of 3354 m³;

It is recommended to irrigate 15 times in soils with medium sandy mechanical composition, in the 4-9-2 system according to growth phases, with an average irrigation rate of 245-227-279 m³ per hectare and a seasonal irrigation rate of 3583 m³.

Elements of Drip Irrigation Technology to implement scientifically based irrigation procedure in the field:

in soils with a light mechanical composition, dripper water consumption is 1.6 l/h, dripper interval is 40 cm., placement of the drip irrigation pipe next to each row of cotton (with an interval of 7-10 cm.);

in soils with medium mechanical composition, dripper water consumption is 1.6 l/hour, the interval between drippers is 40 cm., it is recommended to place the drip irrigation pipe in the middle of the field within the rows of cotton.

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