Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5055 - 5061
Received 16 February 2021; Accepted 08 March 2021.

Hydromodule Zoning Southern Karakalpakstan and Optimal Cotton Irrigation Regime

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ANNOTATION. In the context of water scarcity, changes in the hydromodular zoning of irrigated lands in southern Karakalpakstan, the distribution of irrigated lands by hydromodular regions and the definition of scientifically based irrigation regimes for cotton in the main hydromodular regions.

INTRODUCTION. The water that enters the plant cell leads to an increase in the volume of sap in the cell and increases its pressure on the cell membrane, thereby maintaining the turgor state of the cell and plant tissue. Along with the water in the soil, several nutrients enter the plant and spread to the leaves and other organs. The process of photosynthesis, which ensures the formation of organic matter, cannot be carried out without water.

The mechanism of water movement in plants and the relationship between physiological processes and productivity of the plant water regime have been studied by many scientists: S.N. Ryjov (1937, 1953), H. Karrien, S. Stokking (1951), N.A. Petinova (1954) and others.

The highest productivity of all agricultural crops is achieved by providing them with uninterrupted water supply at all phases of the period of growth and development.

The basics of control of cotton irrigation norms were recommended by S.N. Ryjov (1938). According to his recommendation, the main part of the cotton root is placed in a layer of 1 m, and the main part of the water is absorbed for transpiration from a depth of 30-90 cm. Therefore, it was found that irrigation is less effective than wetting the layer after 100 cm.

One of the main issues to be addressed during the study of irrigation procedures and the development of recommendations for its application is that the pre-irrigation moisture in the soil is at the lowest moisture capacity, which requires regular irrigation. Plants consume different amounts of water during the irrigation period, so a specific irrigation regime has been established for each transition phase of their development, taking into account soil conditions.

Based on the experiments conducted by M.Khamidov, it was found that the most favorable conditions for growing cotton in low-salinity meadow heavy sandy soils with a groundwater level of 1.2-1.6 m, when the soil moisture content before irrigation is limited to 70-80-60%; as it arises. Such a soil moisture regime is created by nutrient irrigation and 4 irrigations according to the 1-3-0 scheme, 700-900 m^3/ha irrigation norms and 4200 m^3/ha seasonal irrigation norms (including nutrient irrigation). With such an irrigation regime, a cotton yield of up to 45 quintals / hectare can be obtained.

The salinity of irrigated lands in the Amudarya region is an important problem, as well as the proximity of groundwater to the surface and high mineralization worsen the reclamation

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situation. To do this, it is necessary to rehabilitate the irrigation network and the collector-drainage network on these lands.

Soils are subject to 1% water erosion and 21% wind erosion. The density, specific gravity, total porosity of the right and left banks of the Amudarya as soils varies depending on the mechanical composition of the soil, the degree of irrigation, the chemical composition.

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The following is information on the districts where the experiments are being conducted.

Table 1. Information on the mechanical composition of the soils of irrigated lands of Beruni district of the Republic of Karakalpakstan

№	The name of the array	Mechanical structure					
		heavy	average	light	sandy	sandy	total
1	Abay	121,0	1512,0	715,	44,0	153,0	**2545,0**
2	Guliston	506,0	459,0	336,6	267,0	-	**1568,6**
3	Biybozor	955,0	1079,6	95,0	221,0	-	**2350,6**
4	Broiler	92,9		227,1			**320,0**
5	Ulugbek	547,4	973,9	371,2	264,4		**2156,9**
6	Free	531,6	891,6	170,0	69,3		**1662,5**
7	Forestry		44,8	22,2			**67,0**
8	Berdaq Primov	30,0		14,0			**44,0**
9	Algabos	146,3	984,5	142,2	115,0	28,6	**1416,6**
10	Beruniy	424,7	1449,3	2125,6		350,2	**4349,8**
11	Sevara Sardor	287,0	300,0	74,0			**661,0**
12	Oltinsoy	1052,1	75,0	702,6	717,3	5	**2552,0**
13	Urgench trans gas	115,2	143,3				**258,5**
14	Maktumquly	76,0	1276,8	335,2	64,0		**1752,0**
15	A.Navoiy	86,9	758,3	272,4	354,2		**1471.8**
16	Karakulcha		98,8	31,2			**130,0**
17	R.Yuldashev	18,0	80,0	38,5		7,5	**144,0**
18	Qiyotabad	463,5	579,7	179,7	245,6		**1468.5**
19	Jumaniyazov	154,6	585,6	599,6	388,4	20,0	**1748,2**
20	It's impossible	20,0	236,0	36,0			**292,0**
21	Beetroot	79,0	574,0	42,0			**695,0**
22	Aftogen Davletboy	65	131,0		16,0		**212,0**
23	Shabboz	784,3	525,7	511,4	137,6		**1959,0**
total		**6,556,5**	**12,758,9**	**7,041,5**	**2,903,8**	**564,30**	**29825,0**

The research was conducted on the irrigated lands of Reimbay Boshliq farm in Beruni district. Collector-drainage networks have been built on the lands of all farms, irrigation

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networks are of engineering nature. To irrigate agricultural crops, water is delivered to the fields through horn and arrow ditches, and the crops are irrigated side by side. The soil of the farm is weak and moderately saline.

Table 2. Field experiment implementation system

№	**Pre-irrigation soil moisture, in% relative to the limited field moisture capacity**	**Irrigation rate, m^3/ha**
1	Production control	Actual measurements
2	70-70-60	70-100-70 см қатламдаги намлик дефицити бўйича
3	70-80-60	
4	70-80-60	Moisture deficit in the 70-100-70 cm layer was increased by 30%.

According to the agro-technical measures carried out in the experimental field, it is located on the farm "Reimbay boshliq" in Beruni district of the Republic of Karakalpakstan. The soils are medium sandy soils, and on December 4, 2017, November 28, and November 30, 2017-2019, the autumn soil layer was plowed every year at a depth of 35-40 centimeters. From February 24-26 to March 6, the field was leveled annually. Floors and ceilings were removed from 22 to 27 February to prepare the field for saline washing. The experimental field was washed twice on a small floor (0.03-0.05 ha) at a saline leaching rate of 2400-2600 m^3/hatwice a year: from February 26-28 and from March 14-18. After tillage, on April 16-21, in addition to preparing the soil for planting, nitrogen N-30 kg / ha, phosphorus P-100 kg / ha and potassium K-50 kg / ha were applied in pure form, chiseled twice longitudinally and transversely and 3 times. storm and 2 times a quality break. Cotton was planted on April 18-22, 2018, April 19-21, 2019, and April 18-20, 2020. 60-70 kg of seeds were used per hectare. Cotton rows were cultivated between May 5-31.

Figure 1. The process of digging a soil section in experimental fields.

In the cultivation of agricultural crops, it is necessary to ensure the irrigation regime for each

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plant species, in a specific climatic conditions of the irrigation regime. Agricultural crops react differently to water supply conditions depending on the biological properties of cotton. But usually when the demand for water is continuously met throughout the entire period of growth and development, all plants are guaranteed maximum yields.

Cotton planted in the experimental field was irrigated on the basis of the specified humidity. During the growing season, the number of irrigations in each variant of cotton, its duration, and the total amount of water given differed significantly.

Data on the irrigation regime in the experimental fields planted with cotton are given in Table 3. During the growing season, the moisture content of the active layer of the soil was consistently high due to irrigation with twice the large irrigation norms 1109-1345 m^3/haduring the flowering-harvesting period according to the 0-2-1 scheme of cotton, irrigation norms 1196-1246 m3 / irrigated and the seasonal irrigation norm was 3644-3866 m^3/ha. The period between irrigations was 25-27 days.

Table 3. Irrigation regime of cotton

Indicators	**Irrigation, m^3/ha**						**Irrigation scheme**	**Seasonal irrigation rate, m^3/ha**
	1	**2**	**3**	**4**	**5**	**6**		
2018 year								
Irrigation period	18.06	13.07	08.08	3.09			1-2-1	4678
Irrigation interval, days		25	26	26				
Irrigation rate, m^3/ha	1247	1126	1164	1141				
Irrigation period	20.06	14.07	06.08	03.09			1-2-1	3335
Irrigation interval, days		24	23	27				
Irrigation rate, m^3/ha	650	891	921	873				
Irrigation period	19.06	07.07	24.07	17.08			1-2-1	2854
Irrigation interval, days		18	17	24				
Irrigation rate, m^3/ha	643	663	693	855				
Irrigation period	18.06	08.07	30.07	25.08			1-2-1	3731
Irrigation interval, days		20	22	26				
Irrigation rate, m^3/ha	823	883	901	1124				
Irrigation period	19.06	14.07	09.08	4.09			1-2-1	4744
Irrigation interval, days		25	26	26				
Irrigation rate, m^3/ha	1276	1159	1142	1167				
Irrigation period	22.06	15.07	05.08	02.09			1-2-1	3422

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Irrigation interval, days		23	23	26				
Irrigation rate, m^3/ha	664	926	956	876				
Irrigation period	21.06	09.07	26.07	18.08			1-2-1	2789
Irrigation interval, days		18	17	23				
Irrigation rate, m^3/ha	633	623	668	865				
Irrigation period	20.06	11.07	02.08	29.08			1-2-1	3711
Irrigation interval, days		21	22	27				
Irrigation rate, m^3/ha	836	848	888	1139				

In the 1st variant of Experiment 2, where the pre-irrigation soil moisture is 70-80-60% of the limited field moisture capacity, cotton is grown once during the growing season, once before the flowering period, twice during the flowering period and during the ripening period. once, a total of 4 times, irrigated with irrigation norms of 1112-1291 m^3/ha. The seasonal irrigation rate was 4638-4744 m^3/ha. The period between irrigations was 25-26 days.

In option 3, where soil moisture before irrigation was 70-80-60% relative to ChDNS, cotton was irrigated once with a watering rate of 633-643 m^3/haduring the flowering period, and 623-693 m^3/haduring the flowering period. with cotton watered twice and and watered once at the rate of 855-882 m^3/haduring the ripening period of the crop. The seasonal irrigation rate was -2789-2867 m^3/haor 1824-1955 m3 / ha of river water was saved compared to the control option. The period between irrigations of cotton was 17-24 days.

Phenological observations on the growth and development of cotton show that maintaining an optimal water regime in the root spreading layers of the plant in saline or saline soils depends on the composition and amount of water-soluble salts in the soil, which determines the direction of physiological processes in plant bodies. In such areas, the main period of cotton cultivation is the flowering and fruiting phase of cotton

The central climate zone is characterized by the following indicators: growing season 200-215 days; the sum of the temperatures from April 1 to October 1 is 4000-4200; average annual air temperature 12.5-13.5; year-round evaporation 1500-1600mm; The average temperature in July is 26-28.

CONCLUSIONS

The following preliminary conclusions can be drawn from field experiments on the development of scientifically based irrigation procedures for cotton in the alluvial soils of the ancient irrigated meadows of Beruni region:

1. At the beginning of the experiments, the volumetric weight of the soil in the plowed 0-30 cm layer was 1.35-1.37 g/cm^3 1.37-1.39 g/cm3. At the end of the growing season, the volumetric weight of the soil increased in all experiments under the influence of cotton care and various irrigation regimes. The lowest soil compaction was in variant 3 of the experiments, which was 0.01–0.02 g/cm^3.

2. At the beginning of the experiments, the water permeability of the soil for 6 hours was 963-996 m^3/ha or 0.268-0.277 mm / min (Experiment 1), 1258-1300 m^3/ha or 0.349-0.361

mm / min (Experiment 2) and 1462- 1501 m^3/ha or 0.406–0.417 mm / min (Experiment 3). By the end of the growing season, the water permeability of the soil decreased in all variants, such as volumetric mass, but in 3 variants, when the soil moisture before irrigation was 70-80-60% of the limited field moisture capacity, this figure was 126-130 m^3/ha, 0.035-0.036. mm / min.

3. In option 3, when irrigating cotton, the soil moisture before irrigation was 70-80-60% of the limited field moisture capacity. m^3/ha of cotton was irrigated twice and the crop was irrigated once during the ripening period at 855-882 m^3/ha. The seasonal irrigation norm was 2789-2867 m^3/ha, or 1824-1955 m^3/ha of river water was saved compared to the control option and a higher yield was obtained from cotton.

4. Irrigated lands of the southern districts of the Republic of Karakalpakstan belong to one soil-climatic zone - desert zone, three soil-ameliorative areas within this zone. Irrigated lands of Khorezm region and the southern districts of the Republic of Karakalpakstan are divided into 9 hydromodule regions: I, II, III, IV, V, VI, VII, VIII and IX, depending on the thickness of the aeration layer, mechanical composition, location and groundwater level.

5. 25.78% of the total area of the southern districts of the Republic of Karakalpakstan belong to the VII, 34.37% to the VIII and 21.86% to the IX hydromodule regions.

6. Scientific basis of cotton in the main hydromodule regions of the southern districts of the Republic of Karakalpakstan: VII, VIII and IX

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