

REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

QUESTIONNAIRE

A	Project title:	Investigation of irrigation organisation scheme and irrigation water use in the state farms of Golodnaya Steppe.
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B	Topic n° : 1	Sub-topic n°: 4
1)	1) 4	Technical field n°: 4
	2) Category 01	

C	Project location: Djizak province, Arnasay district, state Farm N 14a	
	Country: Republic of Uzbekistan	Area: 51,3 ha
	Precise details if possible	
	Country(ies):	Locality(ies):
	City(ies):	Others(s):

D	Duration of the project:	
	Year in which the project was started: 1977	Project completed: 1979
		Expected completion date: 1979

E	Organizations and technical staff involved		
1	Supervisor/project coordinator (SURNAME, First name): Voronov Anatoliy Petrovich		100 %
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	Other counterparts:	Organizations	Surname
	First name	(full name or acronym)	
1			%
2			%
3			%
4			%
	Other collaborators:		man-
	years		

F Funding agencies		
	Full name or acronym	Percentage of project finance provided
1	Ministry for land Reclamation and Water Management	100 %
2		%
3		%

G Summary of research project (see instruction on page 1)

1 Objective and technical fields:

Perfection of surface irrigation technique by furrows on basis of irrigation schemes optimization and modern irrigation technique use.

Objective: Reduction of water losses on field; creation of optimal salt-water regime for cotton and other crops; irrigators' labour efficiency improvement.

2 Scientific and technical approach:

Perfection of surface irrigation by furrows technique and irrigators' labour efficiency increase are based on introduction of more perfect schemes of irrigation organisation and irrigation technique on irrigation systems of Golodnaya Steppe and other schemes of new irrigation in combination with leaching regime of irrigation.

Investigation meaning: Development of the set of technical and reclamation measures on irrigation water and irrigated lands productivity increase, water saving and cotton yield raising.

3 Environment characteristics:

Climate is sharply continental. Annual average temperature is 14⁰C. Precipitation is 280-300 mm with maximum in March-April (to 150 mm).

Relative air humidity is 50 % within growing season, minimum is 30-35 % (August). Absolute maximum of temperature is 43⁰C (July), minimum is 20-25⁰C. Sum of effective temperatures within the growing season is 4204⁰C.

Growing period duration with mean-day temperature more than 10⁰C is 210-220 days.

Evaporativity taking into account coefficient 0,8 is within the limits of 1081-1509 mm.

Total humidity deficit is 1050 mm. Total dryness of climate is aggravated by intensive wind activity. Wind velocity within the warm period is 3,0-3,5 m/sec, wind direction is north-east.

Relief: strongly corrugated plain.

Lithology: alternated loam, sandy loam and sand (thickness is 30 m) - gypsum-bearing horizon is discovered on depth of 1 m with gypsum content up to 3 %. Cover sediments thickness is 5-10 m. Coefficient of permeability is 2-3 m/day. Separating layer thickness is 15-20 m, permeability coefficient is 0,02-0,15 m/day.

Under irrigation groundwater level achieved 2-3 m below land surface. Groundwater salinity is 10-12 g/l. Type of salinity is sulphate with high content of chloride. Water-physical properties soil within 0-100 cm layer: specific weight 2,58-2,66 g/cu.cm; volume weight is 1,3-1,43 g/cu.cm; minimum moisture is 17,7-26 % of volume; porosity under minimum moisture is 18,8-31,1 %.

4 Parameters of Pilot Projects and Technical Solutions

Area of pilot plot is 51,3 ha including cotton - 41 ha, melons and orchards - 10,3 ha.

Water is supplied from canal Y-46 made of reinforced concrete flumes PR-80 with capacity 160-200 l/sec. Irrigation scheme is transverse. Water was provided to the field through the flexible hoses. Irrigation was performed by beats on 1,5-2 ha, Canal's efficiency was 0,95-0,97, technical state was satisfactory. Drainage system was tile, norm of drying up was 2,2 m.

5 Methodology:

Field investigation and study of furrow irrigation technique elements on specially equipped 15 furrows. Each group consisting of 5 furrows represented certain version of test. Water movement rate along dry furrow, furrow filling up, moisture after irrigation and within irrigation interval, intensity of water absorption by soil, absorption pressure of soil moisture were studied.

Pilot plot was equipped by means of measurement of irrigation technique and technology elements and water-salt regime. Systems analysis was used for data processing.

6 Results:

Within the test lots in 3 versions furrow length was 420 m, outlets to the furrows were located each 90 cm. Observations were executed on two irrigations with discharge to the furrow in the first period of irrigation 0,5; 0,75; 1,0 l/sec respectively. After water running to the end of furrow discharge was cut down in all versions to 0,25 l/sec. Time of water running to the end of furrow in the first irrigation was 1175, 920, 43,5 min; in the second irrigation it was 995; 662; 430 min.

Time of additional moistening in the 1st irrigation was 1800; 1650; 1740 min; in the 2nd irrigation - 980; 1320; 1187 min.

Total time of irrigation in the 1st irrigation was 2975; 2570; 2175 min; in the 2nd irrigation -2405; 1982; 1617 min. Irrigation depth in the 1st irrigation depth was 1647;1750;1381 cu.m/ha; in the 2nd irrigation -1350; 1312; 1154 cu.m/ha.

Average depth of the furrow filling up in the 1st irrigation was $6,48 \pm 0,73$; $6,33 \pm 0,45$; $9,67 \pm 0,58$ cm; in the 2nd irrigation $6,52 \pm 0,56$; $6,41 \pm 0,49$; $8,67 \pm 0,54$ cm respectively. Within the control site under existing irrigation technology irregular water distribution over the field was fixed.

Deviation from applied irrigation norm 3700 cu.m/ha was 2600-5200 cu.m/ha.

From 2,16 ha control site 1,18 ha or 54,6 % was area of flooding after irrigation under average depth of 20 cm.

It was found that cotton total water requirement was 1800 cu.m/ha from applied irrigation norm 1800 cu.m/ha i. e. within the growing season it was not more than 3600 cu.m/ha which is close to minimum cotton water requirement and this norm, in turn, was spent irregularly.

This fact was approved by phenological observations: fall of fruits achieved 82 %. Water use efficiency as a ratio of total water consumption to irrigation depth was in the 1st irrigation $0,49 \times (1800/3700)$ and due to irregularity of irrigation changed from $0,69 \times (1800/2600)$ to $0,35 \times (1800 \times 5200)$; in the 2nd irrigation under irrigation depth 3450 cu.m/ha it was $0,52 \times (188/3450)$. Because of high height of the plants in the 2nd irrigation maximum meaning of this coefficient was not determined.

According to results of test efficiency of recommended technique and technology of irrigation results in growth of irrigators labour productivity and growth of cotton yield on the average on 15-18 %, in irrigation water expense reduction on 19 % (1979/8150). Tests showed principal possibility of irrigation by variable jet.

Discharge of 0,25 l/sec applied in the 2nd period (additional moistening) practically fitted furrow absorption ability, i. e. tail releases were absent.

As a result of irrigation groundwater raise up to 1,5-1,2 m below land surface and soil moisture is always maintained high. Within the observation period it did not decrease lower than permitted limits within 0-100 cm layer. As a permitted limit moisture content of 0,7 FFMC or 21 % of soil volume is accepted.

Salinity survey showed that irrigation norm applied within two vegetation irrigations is insufficient because of salt accumulation at the beginning of September. In the center of furrow chlorine - ion content before the 1st irrigation was 0,95-1,0 % and after irrigation - 1,25-1,37 % within 1 m layer. It witnesses about necessity of the 3rd irrigation . During two irrigations on the versions 2997; 3062 and 2535 cu.m/ha were applied against 7150 cu.m/ha on test site as a whole under total irrigation norm during growing season 8150 cu.m/ha and actual for test site 9700 cu,m/ha including 2550 cu.m/ha within the 3rd irrigation .

Under high irrigation depth 1500-1700 cu.m/ha moistening uniformity decreases to 0,8 that proves expedience of irrigation of depth reduction to 1000-1200 cu.m/ha in order to achieve moistening 0,9.

Final combination of irrigation technique elements under furrow irrigation was established on the basis of tests under leaching regime of irrigation by furrows with length 400 m: discharge into the furrow within time of running $q_1=0,75$ l/sec, within the period of additional moistening $q_2=0,25$ l/sec; time of irrigation 40-48 hours.

Using these elements it is possible to perform 3-4 irrigations by depth 1900-1400 cu.m/ha.

Irrigation technique tested during investigations (irrigation transverse scheme, flexible hoses, polyethylen tubes with regulated outlets) in combination with above mentioned irrigation technology allowed to achieve under leaching regime of irrigation daily irrigators productivity 1,1-1,2 ha versus 0,33 ha during the 1st irrigation) and 0,4 ha (during the 2nd irrigation).

Existing conditions do not allow to implement further measures on irrigation technique improvement without the following actions:

1. prophylactic leveling;
2. quantitative and qualitative change of irrigation technique ;
3. local personnel training.

H Suggested key-words			
1	Irrigation norm	4	soil moisture
2	irrigation depth	5	leaching regime of irrigation
3	discharge into furrow	6	discrete irrigation .

I Most recent publications (maximum 3)				
1	Author(s): A.Morozov, N.Luchinin, V.Tolstov			
	Title: Final report (1977-1979) on the irrigation organizing schemes and irrigation water use in the state farms of Golodnaya Steppe.			
	Publication details: Report contains results of the tests on discrete irrigation under different discharge into the furrow, technique and technology of irrigation and shortages in field preparation and irrigation equipment use.			
	Year of publication: 1979	free access	<input checked="" type="checkbox"/>	restricted <input type="checkbox"/>
2	Author(s):			
	Title:			
	Publication details:			
	Year of publication:	free access	<input checked="" type="checkbox"/>	restricted <input type="checkbox"/>
3	Author(s):			
	Title:			
	Publication details:			
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