

REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

QUESTIONNAIRE

A	Project title: Cotton irrigation regime on hydromorphic soils
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B	Topic n° : 1	Sub-topic n°: 2
1)	1	Technical field n°: 3

C	Project location Horezm province, collective farm "Khalkaabad"		
	Country: Republic of Uzbekistan	Area:	400 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 1980	Project completed: 1990	Expected completion date: 1990

E	Organizations and technical staff involved			
1	Supervisor/project coordinator (SURNAME, First name): Khamidov Mukhammad			100 %
	Organization: TIIMSH			Staff resources
	Address: 39, Kara-Niyazov str., Tashkent telephone: E-mail: fax:			
	Other counterparts:	Organizations (full name or acronym)	Surname	First name
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:

Cotton rotation irrigation regime optimization on hydromorphic soils, which occupy 85 % of Horezm province area.

Objective: Irrigation water 15-20 % saving, support of soil high fertility and yield growth on 10-15 %.

Technical field: Irrigation and watering rates differentiation efficiency grounding with regard to soil moisture deficit and groundwater level and salinity.

2 Scientific and technical approach:

Approval based on water balance and salt regime study under different groundwater level, moisture and soil water-physical properties.

Meaning: Scientific ground for differentiated irrigation rates application, calculated on moisture deficit for slightly salinized hydromorphic soils of Horezm oasis.

3 Environment characteristics:

Climate is sharply continental. Average temperature in July is 12 °C, in January –4.5 °C. Precipitation is 79 mm, including 26 mm within the growing season (April-September). Relative air humidity is 59.5 %, within growing season – 42-46%. Freezing-free period is 170-180 days. Annual evaporativity is 1000-1200 mm.

Relief is flat with slight slope 0.0001-0.0003 to north-west.

Lithology: Cover loam (1.5 m) and sand.

Groundwater: Level depth is 0.5-1.5 m, salinity is 3.5 g/l, type is sulphate-chloride.

Soils: Bog-meadow and meadow-bog, mainly heavy loam and clay with permeability coefficient 0.01-0.1 m/day; volume mass is 1.41-1.47 g/cu.cm; specific mass is 2.60-2.65 g/cu.cm; porosity is 42.3-45.8 %; least water capacity is 21.8-23.6 %; salt content within 1 m-layer is 15-18 t/ha.

River water is polluted by toxic chemicals, its salinity is close to drainage effluent, land are salinized, shallow groundwater provokes soil secondary salinization.

4 Parameters of Pilot Projects and Technical Solutions:

Irrigated area is 400 ha (328 ha net). Land use efficiency is 0.82.

Irrigation network is earthen, efficiency is 0.77, field's efficiency is 0.7. Actual furrow length is 50-120 m, discharge into furrow is 0.55-0.7 l/sec; distance between furrows is 0.9 m, slope is 0.0002-0.0003. Close horizontal drainage specific extent is 40 m/ha; depth is 2.7-3.0 m. Drainage modulus is 0.06-0.09 l/sec/ha. Spring-winter leaching rate is 3-4 th. cu.m./ha. Water supply coefficient is 0.9-0.92.

5 Methodology:

Selected experimental site is typical for Horezm oasis conditions and equipped by lizimeters, weirs of Tomson and Chipoletti design, neutron moisture-meters ВНП-1, observation wells and piesometers. Investigations were performed on 5 versions:

Version 1: control with irrigation regime and technique assessment.

Version 2: under pre-irrigation moisture content 70-60-70 % and irrigation scheme 1-2-0.

Version 3: under pre-irrigation moisture content 70-70-60 % and irrigation scheme 1-2-0.

Version 4: under pre-irrigation moisture content 70-80-60 % and irrigation scheme 1-3-0.

Version 5: under pre-irrigation moisture content 80-80-60 % and irrigation scheme 2-3-0.

Within versions 2, 3, 4, 5 furrow length is accepted as 200-250 m, distance between furrows – 0.9 m; irrigation stream – 0.4-0.6 l/sec; technology – continuous irrigation, irrigation into each second furrow by 3-4 steps.

All versions were repeated 4 times and results were processed by mathematical statistic methods. Test's reliability (accuracy) is 95 %.

Lands were leached before irrigation on the following versions: leaching on large checks (3 ha), leaching on optimal small checks (0.25 ha), leaching on small checks (0.04-0.25 ha). Leaching rates were 6, 5 and 3 th. cu.m./ha 2-3 times. Leaching period: December-January (2/3 of rate) and March (1/3 of rate).

6 Results:

It was found that the version 4 is most efficient. Actual average irrigation norm for cotton was 4.1-4.25 th. cu.m./ha, watering duty was 0.7-1.1 th. cu.m./ha under irrigation interval 18-23 days.

Control irrigation norm was on 11-20 % (version 1) and on 9.6-12 % (version 5) lower to compare with version 4.

Cotton yield was also the best in version 4: version 4 – 4.2-4.44 t/ha; control – on 19-24 % and version 5 – on 4.1-11.3 % lower.

Cotton stems were on 6.0-6.2 % in control (96-98 cm) and 2-2.2 % (92-94 cm) higher than in version 4, i.e. vegetation mass developed intensively at expense of ripe-elements.

Number of boxes in version 4 was 11-14 that was on 7.2-9.6 % more than in version 1 and on 10-14 % than in version 5.

Root system mass in version 4 was the biggest (5.8-5.95 t/ha), in version 1 it was 3.6-3.97 t/ha, in version 5 – 4.0-4.42 t/ha.

Version 4 was better to compare with version 2 and 3, where cotton was subjected to water deficit. In version 2 during growing period water duty was 3.9-3.95 th. cu.m./ha that is 4.5-7.1 % and in version 3 it was 3.6-4.0 th. cu.m./ha less than in version 4.

Cotton yield was significantly lower in version 2, 3 to compare with version 4: 3.5-3.8 t/ha (13.6-16.7 % lower) and 3.23-4.02 t/ha (10-23 % lower).

Water expense per product unit was as follow: version 2 – 1028-1114 cu.m/t, version 3 – 995-1114 cu.m/t, version 4 – 957-976 cu.m/t.

It was delay in growth due to water deficit: version 2 – 78-79 cm; version 3 – 83-84 cm that is 12-14 and 9.8-10 % lower respectively.

Root system mass was 4.36 t/ha (version 2) and 4.96 t/ha (version 3). Number of boxes was also less.

It is found that optimal limits of cotton irrigation norm under shallow groundwater (1-1.5 m) are 4.2-4.25 th. cu.m./ha, number of irrigations –4 by depth 0.7-1.1 th. cu.m./ha under scheme 1-3-0 and pre-irrigation moisture 70-80-60 %.

Under these conditions cotton yield is maximum (4.35-4.48 t/ha). Overirrigation leads to yield decrease. Rigidly limited irrigation (60-70-60 % and irrigation norm 3.6-4.0 th. cu.m./ha, scheme 1-2-0) while accelerating cotton development decreases its yield.

Cotton cultivation under abundant irrigation regime (80-80-60 %) requires the same norm but by implementation of 5 irrigations under scheme 2-3-0 by depth 0.7-1.1 th. cu.m./ha. 2-3 irrigations during sprouting-flowering will promote quick growth of vegetation mass, but will decrease yield (3.2-4.0 t/ha).

Autumn-winter leaching by rate 500 (non-salinized soils), 3000 (slightly salinized), 4500 (middle salinized) and 7500 (strongly salinized soils) cu.m/ha decreased soil salinization from 0.312 to 0.203 %, from 0.52 to 0.371 %, from 0.707 to 0.489 %, from 1.255 to 0.612 % respectively. Water saving is 20-33 %. Optimal number of leachings is 2-3, leaching period is December-January (2/3 of rate) and March (1/3 of rate). Within leached fields cotton yield growth was 0.5-0.8 t/ha, groundwater salinity decrease was 12 %.

Optimal elements of irrigation technique are found as follows: distance between furrows is 0.9 m, length of furrow is 100-250 m, irrigation streams are 0.4-0.8 l/sec, furrow depth is 8-22 cm. Productivity growth for cotton is 0.6-0.8 t/ha, water saving is 7-10 % or 400-600 cu.m/ha.

H	Suggested key-words		
1	Hydromorphic soils	4	Leaching
2	Irrigation rates differentiation	5	Irrigations by steps
3	Irrigation regime	6	

I	Most recent publications (maximum 3)	
1	<i>Author(s):</i> M.Khamidov	
	<i>Title:</i> Agricultural crops irrigation and yield	

Publication details: Specific features of irrigation norms, schedules and schemes for cotton, alfalfa and corn with due regard to pre-irrigation, groundwater level, soil water-physical properties are considered.

Year of publication: 1991	free access <input checked="" type="checkbox"/>	restricted <input type="checkbox"/>	confidential <input type="checkbox"/>
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