

REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

QUESTIONNAIRE

A	Project title: Cotton in-soil irrigation efficiency determination within Golodnaya Steppe new developed lands.
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B	Topic n° : 1	Sub-topic n°: 2
1)	Category 01	Technical field n°: 1

C	Project location Sirdarya province, Okaltin district, state farm 10 "Voroshilov"	
	Country: Republic of Uzbekistan	Area: 120 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 1975	Project completed: 1986
		Expected completion date: 1980, 1986

E	Organizations and technical staff involved		
1	Supervisor/project coordinator (SURNAME, First name): Lunyov Victor		50%
	Organization: SANIIRI Address: 11, Karasu-4, Tashkent telephone: E-mail: fax:		Staff resources
	Other counterparts:	Organizations (full name or acronym)	Surname First name
1	Stulina Galina	SANIIRI	50 %
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)
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1 Objective and technical fields:

Elaboration of optimal water saving technology for cotton in-soil irrigation provoking regularly soil moistening, good soil reclamation state support, water expenses per product unit reduction, high cotton yield.

2 Scientific and technical approach:

Optimal cotton irrigation regime is developed on the base of in-soil irrigation system application. Meaning: creation of scientific-grounded technology of cotton in-soil irrigation providing minimum labour expenses during growing season, water saving and high cotton yield.

3 Environment characteristics:

Geomorphology: alluvial plain with flat relief and slope 0.001-0.0015.

Lithology: multilayer sediments.

Soils: grey-meadow, non-salinized with spotted salinization. Solid residue within 1m-thickness is 0.5-1.2 %, chlorine-ion 0.01-0.02 %. Salinization type is chloride-sulfate. Soils are light and middle loam with heavy loam, gypsum and carbonates interlayers. Water permeability of soil is middle: from surface 0.52 mm/min, on depth of 0.45 m – 0.35-0.40 mm/min. Full field moisture capacity is 21 %, volume mass is 1.2-1.35 g/cu.cm, porosity – 48 %, specific weight 2.60-2.67 g/cu.cm.

Groundwater is slightly salinized (to 4 g/l), level is 2.7-3.0 m. During growing period slight groundwater level raise (0.5 m) was observed.

4 Parameters of Pilot Projects and Technical Solutions:

In-soil irrigation system is attached to typical flume irrigation network within the area of 120 ha (net) and consists of network of underground pipelines: distributive (polymer-metal tubes d-150-250 mm) and perforated polyethylen tubes d-20 mm. Distance between distributors is 100 m, between moistening tubes – 1.2 m. Perforation holes diameter is 2.0-2.5 mm, step is 1.0 m.

In-soil irrigation system (ISIS) is circular that increases irrigation regularity and gives possibility to flash up network periodically. Water release under leaching is performed to collectors.

Depth of tubes-distributors is 0.6 m, moistening tubes – 0.45 m. Water comes out from settling basin with flumes ПП-100 and heads ПК-120 and BK-120. Settling basins' length is 50 m. Field drainage is absent. Along the border of the site inter-farm collector is located with depth 3.5 m.

5 Methodology:

Field investigations and observations on water head in tubes (by piesometers), water distribution during each irrigation along the tubes length (by volumetric method); moisture dynamics before and after irrigation (by neutron activation method, lithium mark and tensiometer); spring soil salinization (by sampling and chemical analysis); cotton water consumption (by thermic balance), water discharge, phenological observations unsaturated zone water-salt balance, groundwater level and salinity.

Control site was under furrow irrigation.

6 Results:

Cotton irrigation regime was studied on in-soil irrigation system. As a control site was taken plot with furrow irrigation. It was found that optimal in-soil irrigation regime consists of 4 irrigations by depth 1-1.2 th. cu.m./ha and irrigation norm 4.2-4.5 th. cu.m./ha. Schedule of irrigation: end of May, beginning and 2nd half of July, 2nd ten days of August. Within the control plot irrigation norm was 5.5-5.8 th. cu.m./ha.

Cotton yield was under in-soil irrigation 4.25-4.57 t/ha, under furrow irrigation – 3.06-3.13 t/ha. Water saving under in-soil irrigation is 20-25 %, yield growth is 1.0-1.5 t/ha. Water specific discharge per product unit is 1100-1200 cu.m/t under in-soil irrigation to compare with 1750-1850 cu.m/t under furrow irrigation.

Transpiration is 75 % and physical evaporation 25 %. Under furrow irrigation transpiration is 65 % and physical evaporation is 35 %. Thus under in-soil irrigation water is wasted more efficiently due to less losses for physical evaporation at expense of 0-10 cm non-moistened soil layer.

Water balance calculation show that under close groundwater level and insufficient operation of drainage almost all water provided for irrigation during growing season is consumed by cotton (89-98 %). Drainage removes about 2-10 %. For groundwater recharge about 2-4 % irrigation water is used. Irrigation water participation in total water consumption was 65-90 %. As a rule, total water consumption exceeds water supply. Deficit is compensated by unsaturated zone moisture stock created before growing season.

Under in-soil irrigation capillary water movement occurs upward due to moisture gradient within the soil: under furrow irrigation moisture movement is downward due to gravity strength, moistening contour is created by the first irrigation and is supported within vegetation. Under rates 800-1000 cu.m/ha given with interval 15-20 days desirable moistening limit is achieved (70-100 % of FFMC) within layer 15-100 cm. Upper dry zone (10-15 cm) plays role of mulch with moisture content 5-10 % and within root zone (40-70 cm) moisture 16-20 % is supported. Absolute salt stock by autumn within 1m-layer under ISIS is 1.5 times less than under furrow irrigation (32 kg.ckv/ha) and 43 kg.ckv/ha respectively).

Salt differentiation along the profile is noted. Under furrow irrigation 0-45 cm layer is desalinized, under ISIS salts are distributed regularly within 0-100 cm layer. By spring salt background practically is smoothed. Leaching was not performed.

Under ISIS too dense cotton bushing is possible. Sort C-8257 under scheme 30x10x1 and density 530 th./ha gave yield 4.31 t/ha.

Average plants density was 75-250 th/ha.

Under ISIS labour expense decreases 2-2.5 times due to exclusion of furrows making and weeds prevention, fertilizer insertion efficiency increases on 7 %, water intake is cut down on 1.300 cu.m/ha, cotton yield growth is 1.0-1.5 t/ha.

Experiment disadvantages:

1. Difficulties of upper layer moistening during the first irrigation under condition of dry spring.
2. Moistening pipes settling.

H	Suggested key-words		
1	In-soil irrigation	4	Irrigation regime
2	Irrigation norm	5	Water saving
3	Watering depth	6	Specific water yield

I	Most recent publications (maximum 3)			
1	Author(s): V.Lunyov, G.Stulina			
	Title: Experience of in-soil irrigation in Golodnaya Steppe			
	Publication details: Cotton in-soil irrigation different regimes, soil water regime dynamics under in-soil irrigation system ISIS and furrow irrigation, cotton water consumption, land use efficiency, cotton yield are considered.			
	Year of publication: 1986	free access <input checked="" type="checkbox"/>	restricted <input type="checkbox"/>	confidential <input type="checkbox"/>
2	Author(s):			
	Title:			
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	Year of publication:	free access <input checked="" type="checkbox"/>	restricted <input type="checkbox"/>	confidential <input type="checkbox"/>
3	Author(s):			
	Title:			

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