REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

QUESTIONNAIRE

A	**Project title:**
	Cotton water requirements definition under two irrigation methods (furrow, sprinkler) and cotton water requirements regulation by lizimeters.

B	**Topic n° : 1**	Sub-topic n°:	01
1)	1	Technical field n°:	1
2)	Category 01		

C	**Project location** Tashkent province, SANIIRI experimental station		
	Country: Republic of Uzbekistan	Area:	90 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 1979	Project completed:	1985
		Expected completion date:	1979, 1983, 1984, 1985

E	**Organizations and technical staff involved**			
1	Supervisor/project coordinator (SURNAME, First name): Zheleznyh Vera			50%
	Organization: SANIIRI			Staff resources
	Address: 11, Karasu-4, Tashkent telephone: E-mail: fax:			
Other counterparts:	Organizations (full name or acronym)	Surname	First name	2)
1	SANIIRI	Cholponkulov Erik		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	50%
2		%
3		%

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

1 Objective and technical fields:

Irrigation technique influence on cotton water requirements and under-irrigation influence on cotton yield within different phases of plant development.

Objective: To determine water balance dynamics under different irrigation technique. To define groundwater share within total water consumption by lizimeters and cotton and corn yield losses due to under-irrigation within different phases of plant development.

2 Scientific and technical approach:

To compare irrigation norm and watering depth under different irrigation technique. Lizimeters investigations: cotton and corn yield losses due to under – irrigation.

3 Environment characteristics:

Climate is continental. Average air temperature is 10.6^0C, including growing season – 21.6^0C and rest of time – 3.2^0C. Frost-free period duration is 205-210 days; precipitation is 370 mm; sum of effective temperatures is 2315^0C. Evaporativity (April-October) is 1100 mm.

Relief: corrugated with total slope to south-west and altitudes 364-394 m.

Soils: typical grey, non-salinizated middle loam.

Soil volume weight is 1.1-1.45 g/cu.cm within arable horizon, within under-arable horizon – 1.35-1.65 g/cu.cm; field water capacity is 20.3.

Groundwater depth is 20-30 m.

Lithology: middle loam (0-27 cm), heavy loam (27-253 cm).

Lizimeters were filled up by loess loam with disturbed structure in 1972, thickness is 120, 210 and 300 cm. Loam is underlaid by sand-gravel layer about 100 cm thickness.

4 Parameters of Pilot Projects and Technical Solutions:

Experimental site's area is 90 ha, including under cotton – 40 ha. Experiments were carried out within area of 18 ha; lizimeter set's area is 0.5 ha.

Number of lizimeters is 6. Irrigation network is earthen. Pumping station capacity is 180-200 l/sec. Water supply is, performed by pipeline with automatic valves. Field slope was 0.003-0.05. Experimental sites area was 10 ha under furrow irrigation and 16 ha under sprinkler irrigation.

5 Methodology:

Pilot sites were equipped by means of measurement of all elements of heat and water balance. Measurement allowed to solve task of cotton field water requirements definition under furrow and sprinkler irrigation.

Cotton water requirements under different groundwater level and yield losses under water deficit during different phases of plant development was determined by lizimeters.

Lizimeters area was the biggest in the former USSR (255 q.m) that permitted to achieve maximum accuracy. Multicriterial analysis was used to process data obtained.

6 Results:

Field tests were executed within cotton field (sort "Tashkent") under furrow and sprinkler irrigation. Within the field under furrow irrigation 4 vegetation irrigations, and under sprinkler irrigation – 7 irrigations were performed.

Irrigation norm was 7275 (furrow) and 3993 cu.m/ha (sprinkler).

Furrow irrigation.

4 waterings were performed by depth: 1658 (23.05.-26.05), 2249 (27.06-30.06), 1715 (25.07-28.07) and 1653 cu.m/ha (27.08-30.08).

Sprinkler irrigation.

7 waterings were performed by depth: 661 (4.05-5.05), 620 (15.05-17.05), 496 (2.06), 630 (10.07-12.07), 506 (30.07-6.08-7.08), 430 cu.m/ha (1.09; 7.09; 10.09).

Soil moisture stock was determined as a difference between its stock in 3 m layer at the beginning of balance period and at its end. Moisture stock within site under furrow irrigation since 13.04 till

1.11 was 14.2 mm and under sprinkler – 312.1 mm. Small stock under furrow can be explained by the fact that last watering was performed in August by depth 1653 cu.m/ha and total evaporation within September-October 1630 cu.m/ha. Rainfall within this period was not available.

During balance period rainfall was 94.6 mm. Total evaporation value is almost equal under different irrigation methods (furrow – 807.9 mm, sprinkler – 806.7 mm). Sprinkler watering depth decrease is compensated by soil moisture stock depletion.

For irrigated field with deep groundwater water-charge irrigation by depth 2000-3000 cu.m/ha should be performed.

Lizimeters' water balance is constituted by precipitation, irrigation norm, watering of lizimeters versus total evaporation.

Lizimeters' water balance elements (1.04-3.09. 1985) under cotton and groundwater level 1.6 m were the following: soil moisture stock changes – 217 mm, groundwater – 77 mm, irrigation norm – 529 mm, watering depth – 32 mm, total evaporation – 936 mm.

Groundwater share within total evaporation is 11.6 %.

For lizimeters with shallow groundwater (1 m): soil moisture stock – 79 mm, groundwater – 98 mm, irrigation norm – 64 mm, precipitation – 81 mm, watering depth – 1004 mm, total evaporation – 1326 mm. Groundwater share within total evaporation is 90.6 %. Water requirements within lizimeters was during June-September depending on groundwater depth: for corn – 6.7-9.4 th. cu.m./ha, for cotton – 6.8-9.2 th. cu.m./ha.

Cotton bioclimatic coefficient depended on its phase of development: May – 0.88; June – 0.75; July – 0.94; August – 1.12; September – 0.99: October – 0.64.

Biggest water consumption is observed under closer groundwater level to land surface.

Under shallow groundwater cotton development is slower on 10-12 days than under deep water.

Evaporation from groundwater surface within lizimeters with exposed soil during period since 1.06 till 30.09.1979 was 509-66 mm.

Transition coefficient from cotton to corn water requirement during growing season is 1.01-1.04. While reducing moisture before irrigation to 40-50 % during blooming-ripening phase yield is cut down on 36-47 %; within phase of germination – 25-35 %; blooming – 4-11 %.

Cotton yield dependence on irrigation norm is as follows: 4789 cu.m/ha – 2.6 t/ha; 6420 cu.m/ha – 3.1 t/ha; 4219 cu.m/ha – 1.61 t/ha.

Lizimetric measurement could be used for crop water demand determination in arid zone.

H	**Suggested key-words**		
1	Total evaporation	4	Groundwater level
2	Sprinkler irrigation	5	Lizimeters
3	Furrow irrigation	6	

I	**Most recent publications (maximum 3)**			
1	Author(s): V.Zheleznyh, Yu. Risbekov			
	Title: Cotton yield data representativeness in lizimeters			
	Publication details: Analysis of experimental investigations on lizimeters compratively with data on cotton fields.			
	Year of publication: 1987	free access [x]	restricted [ ]	confidential [ ]
2	Author(s):			
	Title:			
	Publication details:			
	Year of publication:	free access [x]	restricted [ ]	confidential [ ]

3	Author(s):			
	Title:			
	Publication details:			
	Year of publication:	free access [x]	restricted [ ]	confidential [ ]