REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

QUESTIONNAIRE

A	**Project title:**
	Surface water saving at on-farm level and drainage outflow decrease due to groundwater use and its level regulation

B	**Topic n° :** 1	Sub-topic n°: 2
1)	01	Technical field n°: 3

C	**Project location**		
	Fergana province, Altyaryk district, collective farm "Atakulov"		
	Country: Republic of Uzbekistan	Area:	250 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 1963	Project completed:	1965
		Expected completion date:	1965, 1969

E	**Organizations and technical staff involved**	
1	Supervisor/project coordinator (SURNAME, First name): Usmanov Abbas	100 %
	Organization: SANIIRI	Staff resources
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	Other counterparts: Organizations (full name or acronym) Surname First name	2)
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:

Development of groundwater level regulation technology within on-farm drainage system to save surface water and decrease drainage outflow.

2 Scientific and technical approach:

Main approach is soil moisture within unsaturated zone management by groundwater level regulation under limited fresh water supply for irrigation; partial of full cancellation of drainage water removal outside due to its in-system use.

3 Environment characteristics:

Climate is sharply continental. Average annual temperature is 13-15 ^{0}C, in July 27 ^{0}C. Precipitation is 76-133 mm. Aridity coefficient is 17-32. Evaporativity is 1100-1180 mm. Relative air humidity is 55-65 %.

Relief: Slightly corrugated plain with slope 0.001-0.004.

Lithology: Cover loam (1-4 m), underlaid by gravel and sand. There are two aquifers which are hydraulically connected. The first aquifer (sandy loam, loam, sand) has permeability coefficient 0.5-2.0 m/day. The second aquifer's (gravel, sand) has permeability coefficient is 2.0-5.0 m/day. The second aquifer head is 0.2-1.0 m higher than the 1st one and water overflows from 2nd to 1st aquifer.

Soils: Meadow with capillary moistening. They are characterised by high content of humus and good structure; slightly salinizated (0.3-1.0 %), salinization type is sulphate; Cl'/SO_4" ratio is 0.01-0.5. Volume weight is 1.34 g/cu.cm; specific weight is 2.4 g/cu.cm. Porosity is 44 %, field water specific yield is 33 % of soil mass.

Irrigation water salinity is 0.44-1.0 g/l, groundwater salinity is 0.8-2.0 g/l and decreases downward to 1.5 g/l. Salinization type is sulphate-calcium. Chlorin-ion is 2.3 % of salt solid residue. Drainage water salinity is 0.5-1.5 g/l.

4 Parameters of Pilot Projects and Technical Solutions:

Site area is 250 ha. Cotton share is 60-70 %, rest area is occupied by corn for silage and vegetables - melons.

Irrigation network is earthen and its capacity is 100-150 l/sec. Canals depth is 0.6-0.8 m.

Drainage system is located on low elevated lands; its extent is 13.7 km, specific extent is 36 m/ha. drain depth is 2.4-3.0 m. Distance between drains is 400-650 m under total length of 6.7 km, on which after each 75-200 m partitions are built (totally 27). These structures are concrete tubes D=0.5-1.0 m with metal gates.

Drainage modulus depending on drain depth is 30-150 l/sec/km or 1-3 l/sec/ha.

5 Methodology:

Field investigations on groundwater level regulation, soil water-salt regime study, irrigation regime and crop cultivation under artificially created hydrogeological conditions. There are four hydrogeological zones, within which groundwater level was as follows: 0.6-0.8; 0.8-1.2; 0.8-2.0 and 1.8-2.0 m (natural conditions - control).

Sites were equipped by means of water measurement: soil moisture, groundwater level, soil water-salt regime.

Pilot site was divided in 3 observation sections with 28 experimental fields which characterized described zones and certain conditions (soils, relief, agrotechnique, irrigation, etc.).

6 Results:

Water within drains was raised from 1.0 to 2.7 m within 1-2 days with help of partitions. Groundwater level raised gradually within 8-12 days. Groundwater level raise speed within the first 3 days is 40-50 cm/day within 100 m distance from drain, then it decreased to 10-15 cm/day. Drain influence distance is 150-170 m (sometimes 250-300 m).

Within zone of active drain influence after 5 days groundwater level was 0.8-1.2 m instead of ordinary 1.5-1.8 m. Level decrease occures within 8-10 days. Depletion speed within the first 3-5 days over the stripe 100-130 m is 15-20 cm/day, then decreases to 5-10 cm/day.

Investigations showed possibility of groundwater level regulation within given regime. Cotton irrigation regime depends on groundwater artificial level regime.

- Within the 1st zone during growing season 1-4 waterings were performed under different scheme. The best results were obtained under 1-2 waterings by depth 1.3-1.85 th.cu.m/ha under irrigation scheme 0-1-0 and 0-2-0. Cotton yield was 3.3-3.8 t/ha;
- Within the 2nd zone during growing season 1-3 waterings were performed under scheme 0-1-0; 1-1-0; 1-2-0 by depth 0.75-1.3 th.cu.m/ha. Satisfactory results were obtained by 2 waterings under scheme 1-1-0 and groundwater depth 1.2-1.4 m. Cotton yield was 2.9-3.4 t/ha;
- Within the 3rd zone during growing season 2-3 waterings were performed under scheme 0-2-0; 1-1-0; 0-2-0; 2-1-0 by depth 0.7-1.25 th.cu.m/ha. Good results were obtained under 2 waterings by scheme 1-1-0, 0-2-0. Irrigation interval were 25-60 days. Cotton yield was 3.34-3.53 t/ha;
- Within the 4th zone during growing season 4-6 waterings were performed. Different irrigation schemes (1-2-1; 1-3-0; 2-2-0; 1-4-0; 2-3-1) were used by different depths. Good results were obtained under 4 waterings by depth 0.7-1.6 th.cu.m/ha. Irrigation interval was 25-30 days. Cotton yield was 3.3-3.69 t/ha. Number of waterings increase to 5-6 gave negative results. Cotton yield was 2.25-2.3 t/ha.

Average data on irrigation regime for different zones are shown in table below.

Zone	Experimental site	Field's number	Field area, ha	Number of waterings	Irrigation depth (th.cu.m/ha)	Cotton yield (t/ha)	Yield change
I	9.96	10	0.5-1.9	2.4	1.9-2.1	2.81	1.87-3.8
II	13.2	8	0.6-3.7	2.1	2.2-2.5	2.81	2.72-3.41
III	18.01	5	0.6-12.0	2.6	2.3-2.5	2.97	2.57-3.53
IV							
Control	14.6	5	0.4-9.0	4.8	4.0-5.1	2.66	2.25-3.69

Thus due to groundwater level regulation number of waterings can be reduced (on 2 waterings), irrigation interval may be increased (on 10-30 days). Surface water saving is 2.0-2.5 th.cu.m/ha. The second zone is most efficient.

Drainage outflow reduction is 30-40 % of annual outflow.

Short-term brackish groundwater level raise within growing season does not influence soil salinization.

Area of implementation of studied method is limited by groundwater seepage zone. It can be applied also to transition zone after preliminary study. But in this case soil profile should be desalinizated by preliminary reclamation measures.

H	**Suggested key-words**		
1	Groundwater level	4	drainage outflow
2	Partitions	5	Irrigation regime
3	Soil moisture	6	Soil moisture regulation

I	**Most recent publications (maximum 3)**			
1	*Author(s):* A.Usmanov, Y.Korshunov			
	Title: Soil water and cotton irrigation			
	Publication details: Groundwater use possibility for irrigation by its level regulation, particularities of cotton cultivation under shallow groundwater.			
	Year of publication: 1965	free access [x]	restricted [ ]	confidential [ ]
2	*Author(s):* A.Usmanov			
	Title: Irrigation regime regulation within seepage zone			
	Publication details: Groundwater level formation due to drain influence; its impact on unsaturated zone moisture; possibility of number of irrigations reduction without damage to land reclamation state and cotton yield.			

Year of publication: 1968	free access	[x]	restricted [ ]	confidential [ ]