REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

QUESTIONNAIRE

A	**Project title:**
	Soil and groundwater study under long-term use of drainage effluent and sustainable crop yield
	achievement

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

C	**Project location**		
	Fergana province, Kokand disrict		
	Country: Republic of Uzbekistan	Area:	30-95 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:	1986
		Expected completion date:	1969

E	**Organizations and technical staff involved**				
1	Supervisor/project coordinator (SURNAME, First name): Usmanov Abbas				70 %
	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	Bekmuratov Tashtemir	SANIIRI			15 %
2	Geinz R.	SANIIRI			15 %
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:

To define possibility of saline drainage effluent use for irrigation and leaching.

2 Scientific and technical approach:

Irrigation by saline water influence on soil water-salt regime, soil structure change, possibility of high yield achievement. Investigations were carried out within experimental fields which represent typical hydrogeological and soil conditions of West Fergana.

3 Environment characteristics:

Climate is sharply continental. Precipitation is 76-133 mm. Maximum precipitation occures within winter-spring period. Average air temperature is 13-15.6 ^{0}C, maximum in July is 27 ^{0}C. Aridity coefficient is 17-32.

Average absolute air humidity is 8.6-10.8 mb, relative air humidity is 58-60 %. Minimum water content is in winter (2.8-5.0 mb), maximum in summer (13-18 mb).

Relative humidity is high in winter (78-90 %) and low in summer (33-35 %).

Relief: Slightly corrugated plain with altitude 400 m.

Lithology: Loam, clay, sandy loam and sand from the surface (6-41 m), underlaid by gravel.

Soils: desert-meadow.

Groundwater level depth is 1.2-2.6 m, salinity is 4-12 g/l, type is from chloride-sulphate to sulphate-chloride.

Unsaturated zone permeability coefficient is 0.3-0.9 m/day.

4 Parameters of Pilot Projects and Technical Solutions:

Special sites were selected where irrigation was performed by saline water. Experimental site's area is 5-12 ha.

Drainage network: horizontal with depth 1.5-2.5 m. Specific extent is 35-73 m/ha, drainage modulus is 0.2-0.3 l/sec/ha. On-farm irrigation network is earthen with efficiency 0.8-0.82.

Irrigation norm varied in different periods within 3.61-6.9 th.cu.m/ha. Irrigation was performed in furrows within 2-7 times under norm 1.0-1.88 th.cu.m/ha. Soil moisture before irrigation was supported at 65-75 %. Leaching was performed during autumn-winter time by rate 2.1-6.44 th.cu.m/ha (1963-1967), it coincided with water-storage irrigations within 1980-1986, which were performed by norm 1.5-3.0 th.cu.m/ha.

Source of irrigation is North-Bagdad collector. Drainage effluent salinity within 1963-1967 was 1.2-3.8 g/l, type is sulphate-sodium-magnesium-calcium.

5 Methodology:

Field investigations were aimed to determination of soil-reclamation processes' qualitative indexes and specific features.

Experiments were carried out in two versions:

Version 1 - irrigation by saline water from collectors. Investigations were performed within experimental fields.

Version 2 - irrigation by fresh water (control). As a control were taken adjacent fields with similar conditions and irrigated by surface water with salinity 0.4-0.64 g/l.

Main observations were water measurements and sampling. Multicriterial analysis was used for data processing.

6 Results:

Under influence of long-term irrigation by saline water soil water-salt regime has significantly changed.

Salt content within 2 m-layer during 4 years of irrigation decreased from 1.5-2.34 % to 0.52-1.64 % (1967) and to 0.3-0.92 % (1980). Since 1980 salt content and its chemical composition were stabilized at this level.

Groundwater level initially was 2.2-2.5 m and water salinity was 6-10 g/l (version 1) and 0.8-1.0 m and 7-8 g/l (version 2) respectively. Salinity type was chloride-sulphate. Water-salt balance results show that groundwater recharge within vegetation was 0.92 th.cu.m/ha (1977). Salt re-distribution occurred within soil profile. Water exchange between ground and in-soil water was: +1283; -2150 cu.m/ha (experimental field-3) and -24; +384 cu.m/ha (experimental field-6).

In 1976-1977 water exchange between ground and in-soil water was 2196 (experimental field-3) and -1773 (experimental field-6) cu.m/ha or 18-22 % of annual water supply. This supported soil desalinization or stabilization.
Arable horizon structure positively changed. Light soils of good structure (fractions from 0.25 to 10 mm) in 1962 were 34.9-36.8 % of total area, in 1986 they increased to 54-66 %.
The same improvement was observed on control fields: from 43.3-58.3 % (1980) to 52-58 % (1986). Thus, irrigation by saline water during 25 years did not influence negatively soil structure.
Sodium content within 1980-1986 in arable layer increased from 2.1 to 11.7 %; from 3.65 to 10.8 %; from 0.24 to 6.4 %; from 0.42 to 6.8 % (experimental fields-1, 2, 4, 6) respectively. Within experimental fields-3, 5 it decreased from 4.08 to 2.5 % and from 3.8 to 2.5 % respectively. Under arable layer on experimental fields-1, 2, 3, 5, 6 it increased from 0.27 to 7.5 %; from 2.6 to 9.4 %; from 0.71 to 2.8 %; from 0.44 to 3.9 %; from 0.31 to 1.9 % respectively. Only on experimental field-4 sodium content decreased from 3.27 to 2.9 %. Sharp increase in sodium-ion was observed within experimental fields-1, 2. Soil structure coefficient within all experimental fields remained high. This was provoked by high content of calcium. Similar picture was observed within control fields.
Humus content within arable layer varied (1980-1986): on light soils (experimental fields-1, 2, 5) from 0.91 to 1.38 %; on heavy soils (experimental fields-2, 4, 6) from 0.72 to 1.29 %.
Along with soil desalinization from strong salinization to slight one cotton yield increased from 1.2 to 2.6 t/ha and became equal to control field's value. After soil desalinization since 1968 within all experimental fields high cotton yield was achieved (3.03-3.60 t/ha).
Under leaching regime of irrigation by saline water (2.0-3.5 g/l) crop yield does not decrease.
Long-term (1962-1986) investigations showed possibility drainage effluent (2.0-3.5 g/l) use for irrigation and leaching without damage to crop yield.

H	**Suggested key-words**		
1	Drainage effluent	4	Soil-absorbing complex
2	Water salinity	5	Water-salt regime
3	Soil salinization	6	Water exchange

I	**Most recent publications (maximum 3)**			
1	*Author(s):* A.Usmanov			
	Title: Drainage water quantitative and qualitative assessment and zoning for purposes of its use for irrigation in West Fergana			
	Publication details: Soil water-salt regime, soil-absorbing complex, soil structure, humus content, plants germination and development, cotton yield dynamics under influence of long-term irrigation by saline water are considered.			
	Year of publication: 1969	free access [x]	restricted [ ]	confidential [ ]