REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

QUESTIONNAIRE

A	**Project title:**	Study and development of technology of strongly salinizated soils desalinization acceleration by means of capital leaching through rice sowing under vertical drainage.

B	**Topic n^{o} : 2**	Sub-topic n^{o}: 2
1)	02	Technical field n^{o}: 2

C	**Project location:** SyrDarya province, Saihunabad district, state farm "50 years of Uzbekistan"		
	Country: Republic of Uzbekistan	Area:	311,6 ha
	Precise details if possible Country(ies): City(ies):	Locality(ies): Others(s):	

D	**Duration of the project:**		
	Year in which the project was started: 1959	Project completed: Expected completion date:	1972 1960, 1965, 1970, 1972

E	**Organizations and technical staff involved**	
1	Supervisor/project coordinator (SURNAME, First name): Yakubov Khaldar	20 %
	Organization: SANIIRI Address: 11, Karasu - 4, Tashkent telephone: (3712) 650955 E-mail: fax: (3712) 620558	Staff resources
	Other counterparts: Organizations (full name or acronym) Surname First name	2)
1	SANIIRI, Belousov Oleg	80 %
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 methods of strongly salinizated soils desaliization acceleration by means of capital leaching through rice sowing.

Objective: Irrigated lands productivity improvement and water-salt regime management on background of vertical drainage.

2 Scientific and technical approach:
Strongly salinizated soils desalinization and their productivity increase based on drainability strengthening by means of groundwater pumping. VDS operation under high water supply provides salt removal from unsaturated zone and cover loam.

Meaning: Achievement of high rate lands of desalinization and their productivity growth.

3 Environment characteristics:
Climate is characterized as follow: Average annuals precipitation is 324 mm. 73 - 84 % of rainfals occurre within winter-spring period, maximum is in March (59 mm), minimum - in August (1 mm). Duration of period without freezing is 202 - 208 days. Sum of temperatures is 4300 - 4400 ^{0}C. Average montly temperature is: for July - 27,9 ^{0}C, for January -2,1 ^{0}C, annual is 13,4^{0}C.

Evaporativity is: in January - 18mm, in July - 220 mm, annual is 1217 mm. Relative air humidity (perennial): average annual is 66 %, in December, January - 82 %, in July - 48 %. 88 % of evaporativity occure within growing season.

Relief: slightly corrugated plain with slope 0,0005.

Lithology: alluvial sediments. Cover loam (Thickness is 18 - 25 m, permeability coefficient (KP) is 0,07 - 0,1 m/day. Loam is middle and heavy with gipsum stratum on depth 0,7 - 1,5 m (KP = 0,01 - 0,08 m/day. Cover loam is under laid by sand-gravel-pebble thickness (with loam and clay stratum) (50 - 100 m, Kp = 40 - 50 m/day).

Pilot site is characterized by inflow exceedance over outflow on 1000 - 1500 cu. m/ha. Before VDS construction artesian head was 0,5 - 1 m higher to compare with groundwater level. After VDS operation started it became 0,65 m lower. Actual drainage modulus was 0,23 l/sec/ha per year. Water - physical properties of soils are as follow: volume mass is 1,3 – 1,6 g/cu. cm, specific weight is 2,6 - 2,7 g/cu. cm, porosity is 47 - 48 %, maximum hygroscopy is 6 - 10 %, full field moisture capacity is 32 - 35 % of soil volume, water supply coefficient was 0,06.

Soil salinization type was chloride-sulphate and sulphate. Main amount of salts concentrated within 0 - 40 cm - layer, where solid residue is 1,5 - 3,0 % and chlorine-ion content is 0,02 - 0,45 %. Downward salt content decreases (no more than 0,3 - 0,5 %): Within the site, where leaching was performed, leaching water salinity was 1,5 g/l on solid residue and 0,3 - 0,5 g/l on chlorine-ion. Groundwater level before leaching was 3 - 3,5 m, its salinity was 6 - 25 g/j.

Within the site, where rice was grown, water salinity was from fresh to 3 - 3,5 g/l. Before irrigation groundwater level was 2,3 - 3,0 m, its salinity was 5,6 - 8,7 g/l on solid residue and 1 - 3,2 g/l on chlorine-ion. Piesometric head was 3 - 3,5 m below land surface.

4 Parameters of Pilot and Technical Solutions:
Pilot site's area is 14 ha for capital leaching application and 29,7,5 ha for rice planting. Leaching

was performed on background of vertical drainage. VDS technical parameters were the following: well depth - 65 - 80 m, well discharge - 100 - 150 l/sec, specific yield - 8 - 15 l/sec/m/ Area served by one well - 110 ha. Irrigated area - 1538 ha.

Land use efficiency - 0,78, non-irrigated area - 1452 ha with efficiency -0,16.

5 Methodology:

Field investigations and observations on unsaturated zone, groundwater and irrigated lands as a whole water-salt regime. Accounting all elements of water-salt balance. Pilot site was equipped by means of measurement and accounting. Detailed measurement were performed additionally within 3 special sites (area is 225 sq. m).

6 Results:

VDS from 28 wells was put in operation in 1965. Under VDS operation cover loam high drainability was achieved and possibility was created to regulate strongly salinizated lands desalinization intensity. Field observations were performed after capital leaching and rice sowing results. Water supply regime in combination with VDS pumping regime permitted:

- to provide high drainability within all pilot sites and achieve overflow from cover loam to groundwater 10 - 12 th. cu. m/ha under capital leaching by rate of 16 - 31 th. cu. m/ha and under leaching through rice cultivation by average water supply duty 44500 cu. m/ha, surface runoff 19 - 20 th. cu. m/ha and total evaporation 11 - 12 th. cu. m/ha.

- to achieve intensive desalinization of unsaturated zone within all pilot sites. Under capital leaching (1966) by N =18000 cu. m/ha unsaturated zone was desalinizated from 0,146 to 0,046 % on chlorine; within the experimental sites by N = 331200 cu. m/ha - respectively from 1,82 to 1,28 and from 0,215 to 0,045 %

Under leaching through rice cultivation (1967-1968) desalinization was achieved (within 0-3 m) from 1,61 to 1,25 % on solid residue and from 0,17 to 0,046 on chlorine-ion. Cover loam thickness (0-20 m) leaching decreased amount of salt stock on 470 t/ha and 237 t/ha on chlorine (initial values were respectively 2122 and 368 t/ha).

- to regulate unsaturated zone and cover loam desalinization rate by means of leaching by different rates (depending on salinization level) and by creation of free volume due to groundwater pumping. High leaching regime was supported within the pilot sites

B + Oc : ET =1,4 - 1,8

- to desalinizate groundwater; if at the beginning of leaching its salinity increased from 9 to 17 g/l, later it decreased to 3,5 g/l. During the leaching sharp change in salt composition occured: toxic salts amount decreased on 63 %, gipsum increased on 0,04 %; Cl/SO_4 ratio changed from 6.8 to 26,0;

- to prove high desalinizating effect of capital leaching on background of vertical drainage; water-salt balance of 1-m layer was negative with salt removal 54,8; 71,7; 114,7 t/ha under desalinizating discharge 11,0: 18,0 (gross and 20 th. cu. m/ha (net)

3m - layer under rice salinity decreased on 0,34 % on solid residue and 0,125 % on chlorine-ion under their initial content 1,58 and 0,17 % respectively. Field tests and calculations showed that along with water desalinization water expense for 1 t of salt removal sharply increases that is why leaching of strongly salinizated soils by rates more than 12 - 13 th. cu. m/ha is not reasonable. More effective is to desalinizate such soils by means of autumn - winter leaching regime of irrigation.

- to obtain rice yield in average 2,4 - 2,8 t/ha; somewhere it achieved 5,0 - 5,3 t/ha; to obtain on leached lands 2,5 - 2,8 t/ha cotton in 1969 while it was before only 1,4 t/ha.

Economic efficiency was 270 - 290 rouble/ha.

H	**Suggested key-words**		
1	Capital leaching	4	Strongly salinizated lands

2	Leaching through rice	5	Desalinization rate
3	VDS	6	

I	**Most recent publications (maximum 3)**			
1	Author(s): Kh. Yakubov			
	Title: Salinizated lands reclamation on background of vertical drainage.			
	Publication details: Principles of zoning of irrigated land are considered. Description of soil desalinization process is given. Recommendations on VDS pumping regime with regard to groundwater use for irrigation are shown.			
	Year of publication: 1990	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 [ ]