

REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

QUESTIONNAIRE

A	Project title: Irrigated lands water-salt regime and vertical drainage operation management in Jeticay and Kirov districts of Chimkent province.
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B	Topic n° :1	Sub-topic n°: 2
1)	1	Technical field n°: 2
2)	Category n°: 02	

C	Project location:		
	Country: Republic of Kazakhstan	Area: 117th. ha	
	Chimkent province , Kzylkym massif		

D	Duration of the project		
	Year in which the project was started: 1989	Project completed: 1991	
		Dates of Expertise: 1990	

E	Organizations and technical staff involved			
1	Supervisor/project coordinator: Ikramov Rakhimjan Organization: SANIIRI Address: 11, Karasu - 4, Tashkent telephone: 7 (3712) 65 95 56 fax: E-mail:			%
				Staff resources 40
	Other counterparts:	Organizations	Surname	First name
1	Yusupov Shukhrat			60%
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
<p>1 Objectives and technical field: Irrigated lands productivity increase due to reclamation measures improvement. Systems analysis of actual reclamation regimes together with agricultural crops yield, drainage system workability.</p>	
<p>2 Scientific and technical approaches: Assessment of vertical drainage system(VDS) operation, its technical state, irrigation and leaching regime and irrigation water quality influence on ecological-reclamation processes within the large irrigation scheme.</p>	
<p>3 Environment characteristics: Climate is sharply continental. Average air temperature is 12,8 -13,3 °C, monthly maximum is 27,2 - 29,0 °C (July) and minimum is 2,3 - 3,9 °C (January). Frost-free period duration is 175-200 days. Sum of positive temperatures is 4000-4150 °C. Precipitation is 240-360 mm per year. Evaporativity is 1150-1460mm, including within the growing season 100-1360mm. Relative air humidity within winter - autumn period is 79-83%, in summer it is 43-45%. Geomorphology: SirDarya river alluvial plan. Relief is slightly corrugated, slopes are 0,0002 0,0003. Lithology: Multilayer quaternary deposits: topsoil is cover loam (5-25m, permeability coefficient is 0,13 - 0,15 m/day); lower sand is exposed on depth of 25-150m, permeability is 25-35 m/day. Loam resistance coefficient is $\phi = 150-200$ and overflow coefficient $B = 200-250m$ under its intensity $W = 0,02 -0,03$ m/day. Before land development groundwater level was deeper than 10-15m; (spring) and 2,5 m (autumn). Water salinity varies within 5-10 g/l,. Salinity type is sulphate-chloride. Deep waters are artesian, piezometric head is 0,05-0,5m higher than groundwater level. Groundwater inflow is 500-1500 cu.m/ha. Soils: sandy loam, light and middle loam. Unsaturated zone soils permeability coefficient is 0.15-0,03 m/day. Water specific yield $\mu = 0,08-0,1$, salt specific yield $\alpha = 1,2 -1,5$.</p>	
<p>4 Parameters of Pilot Projects and Technical Solutions: Djetisay district irrigated area is 56 th.ha (gross) and 38.5 th.ha (net). Land use efficiency is 0,69. Irrigated area in Kirov district is 61 th.ha (gross) and 37 th.ha (net), land use efficiency is 0,61; Main occupation is cotton growing and cattle breeding. Water supply is performed through inter-farm canal from Kirov canals. Total extent of canal is more than 1,500km and they mainly have earthen canals. Head water-intake is 100-110 cu.m/sec. Kirov canal coefficient is 0,82-0,98 and system's efficiency is 0,65-0,75. Collectors' specific extent is 5,8m/ha. Vertical drains were constructed in Djetisay (285 wells) and Kirov (273) districts. Well depth is 55-75m, drilling diameter is 426mm, screen length is 15-30m with gravel-sand filling. Well discharge is 50-75 l/sec, specific yield is 4-6 l/sec/m.</p>	
<p>5 Methodology: Summarizing and analysis of information from operational and design organizations. Calculations of common and private water balance. Vertical drains operation regime observation.</p>	
<p>6 Results: Since 1965 territory's drainability improvement has been started by vertical drainage. Vertical drainage operation permitted:</p>	

- to create high drainability of an area, providing groundwater overflow from cover loam to pumped aquifer (3-6 th.cu.m/ha);
- to regulate groundwater level within broad limits: from 1,8 2,2 m (spring), to 3,0-4,0 m (autumn before leaching). Piezometric head was kept 0,4-0,8m lower than groundwater level;
- to manage by groundwater lowering rate from 0,2-0,5 to 0,6-12 cm/day;
- to establish irrigation norm within growing season as 3000 -4500 cu.m/ha;
- to achieve soil desalinization at expense of winter-spring leaching: on strongly salinized soils by norm 6500-7800 cu.m/ha, on middle salinized by norm 4500-5000 cu.m/ha, on slightly salinized by norm 2500 cu.m/ha;
- to establish average annual water duty as 7,0-11,0 th.cu.m/ha and provide leaching regime of irrigation.

$$K = (B+O) / ET = 1,15-1,28$$

- to provide high rate of soil desalinization: by 1980 non-salinized lands constructed 70-75% versus 40-45% before vertical drainage construction;
- to stabilize pumped water salinity on 4-5 g/l;-to achieve cotton yield 3,7-4,2 t/ha by 1970 and keep it up to 1980.

Economic efficiency was 220-300 rouble/ha.

Unfortunately starting from 1980 certain changes occurred:

- irrigation water salinity increased by 1990 up to 1,2-1,4 g/l versus initial salinity 0,6-0,8 g/l (1970);
- groundwater depth on average is within growing season 1,86 -2,6m;
- vertical drains are 15-20 years old, their capacity decreased 30-35% due to screen colmatation and average discharge fell down on 25 l/sec;
- irrigation water supply decreased 20-25% due to leaching rate cut down;
- cover loam drainability decreased by 3-4 times (by 1992 it was 100-1400cu.m/ha);

Under these conditions soil salinization restoration began. Slightly salinized soils were 40-45%, middle salinized 19-23%, strongly salinized 8-10%;

- cotton yield varied 1,9-2,3 t/ha.

On the basis of water-salt balance calculations recommendations on reclamation regime improvement and VDS operation correction were developed to provide:

- water supply to irrigated field 8300 cu.m/ha;
- pumped water volume 1800-2000 cu.m/ha;
- groundwater depth regulation within 2,2-2,9m (spring), 1,9-2,3 m (summer), 3,1-3,4 m (autunum);
- salt content within unsaturated zone decreased on 8-10 t/ha.

These measurements will allow to stabilize reclamation processes, to raise VDS workability and agricultural crops yield.

H	Suggested key-words		
1	Vertical drainage system	4	Leaching regime irrigation
2	Soil water-salt regime	5	Forecast
3	Irrigation water salinity	6	Desalinization rate

I	Most recent publications (maximum 3)			
1	Author(s): H.Yakubov, R. Ikramov, Sh. Yusupov, F. Umarov			
	Title: Recommendations on correction of vertical drainage system operation regime in Djetisay and Kirov districts of Chimkent province.			
	Publication details: Actual reclamation processes were studied, vertical drainage parameters are shown. On the basis of water-salt balance calculations recommendations are developed on reclamation situation improvement.			
	Year of publication: 1990	free access <input checked="" type="checkbox"/>	restricted <input type="checkbox"/>	confidential <input type="checkbox"/>
2	Author(s):			
	Title:			
	Publication details:			
	Year of publication:	free access <input type="checkbox"/>	restricted <input type="checkbox"/>	confidential <input type="checkbox"/>
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