

REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

QUESTIONNAIRE

A	Project title: Study of reclamation efficiency of vertical drainage in rice -cotton rotation under conditions of hardly rehabilitated lands represented by thin cover sediments and cleavage aquifers.
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B	Topic n° : 2	Sub-topic n°: 2
1)		Technical field n°: 3
2)	Category n°: 02	

C	Project location		
	Country: Republic of Kazakhstan	Area:1327 ha (net)	
	Chimkent province, Kyzilkum massif, state farm «Dostyk»		

D	Duration of the project:		
	Year in which the project was started: 1978	Project completed: 1983	
		Dates of Expertise: 1983	

E	Organizations and technical staff involved			
1	Supervisor/project coordinator: Yuldashev Gairat Organization: SANIIRI Address: 11, Karasu-4, Tashkent telephone: 65 32 41 fax: 65 05 58 E-mail:			%
				Staff resources 40
	Other counterparts:	Organizations	Surname	First name
1	Djurayev Muradjin , SANIIRI			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 <i>Objective and technical fields:</i> Establishing of vertical drainage wells (VDW) reclamation efficiency irrigated lands water - salt balance regime regulation development and systems operation providing water consumption minimization under high rate of soil desalinization in lower reaches.</p>	
<p>2 <i>Scientific and technical approaches:</i> Establishing of VDW reclamation efficiency is based on system operation particularities, irrigation influence on hydrogeological reclamation situation, VDW system operation regime, providing optimal soil rehabilitation, soil regime within the alluvial plain, represented by cover sediments and cleavage aquifers..</p>	
<p>3. <i>Environment characteristics</i> Kyzilkum scheme is characterized by dry and hot summer, dry and warm autumn, short unsteady winter and warm spring. Average annual temperature is 11.6 - 13.6 ° C. Precipitation is 160 -225 mm. Air humidity is 35.8 - 58.6 %. Wind velocity is 2.4 -3.2 m/sec with maximum 20 -25 m/sec. Period without freezing is 169-185 days. Sum of positive temperatures is 4150-4589 ° C. Evaporativity slightly exceeds precipitation. Relief: flat, slightly corrugated. Quaternary depositions are represented from the surface by loam, sandy loam, clay (0.1 -10 m) and sands. Water bearing rocks are represented by sands from silty to middle-grained. Average permeability coefficient is 9.9 m/day. Water conductivity is 1000 sq. m/day. Fresh water prevails along the river within the stripe 5 -10 km width. All over the scheme brackish water is typical (1 -3 g/l), type - sulfate. Soils: meadow, deserted, with low content of humus and different level of salinization . Salinization type - chloride- sulfate. Soil volumetric mass is 1.35 -1.68 g/cu.cm, specific mass is 2.68 g/cu. cm. Total porosity within upper horizons is 45 -50 % and within lower ones - 38 -43 %. Full field moisture capacity is 23.6 %, within sandy and sandy loam horizons it decreases to 12-17 %.</p>	
<p>4. <i>Parameters of Pilot Projects and Technical Solutions:</i> Pilot plot is located in cotton state farm «Dostyc». Area is 1724 ha (gross); irrigation area - 1327 ha. Eight vertical drainage wells are operated. Their depth is 40 -59 m, screen's porosity is 17 %. Well's yield is 35 -45 l/sec, specific yield - 1.8 5.6 l/sec/m. Water for irrigation is taken from Kyzilkumsky canal in concrete lining and flume network. Canal efficiency is 0.9. Head flow is 1.5 cu.m/sec, flume network specific length is 24 m/ha.</p>	
<p>5 <i>Methodology:</i> Field observations on water and salt movement, water -salt balance of unsaturated zone and groundwater measurements. For this purpose pilot site was equipped by means of accounting and measurement.</p>	
<p>6 Results: There are 275 wells in operation within the Kyzilkumsky scheme. Total discharge is 11.0 cu.m/sec, including 4.5 cu.m/sec for cotton state farms. Since 1978 till 1983 system operation efficiency was 0.19 -0.48. Wells worked intensively during growing season to use water for irrigation. Crop pattern: cotton - 60 -80 %; alfalfa -11 -37 %. During growing season cotton was irrigated 3 -5 times by norm of 540 -2300 cu.m/ha; irrigation norm achieved 5864 -9387 cu.m/ha, including from wells -707 -2006 cu.m/ha. Water duty was 5870 -8680 cu.m/ha. Precipitation was 169 -2770 cu/m/ha. Filtration losses were 755 -862 cu.m/ha. Total evaporation and transpiration were 7905 -8145 cu.m/ha. Drainage outflow varied within 2089 -3412 cu/m/ha, including 1069 -2509 cu.m/ha within growing period. Main part of drainage outflow was formed from well pumping minus water duty share. Total water storage charges were from + 2023 to -1067 cu/m/ha. Water stock increase occurred mainly within</p>	

the growing period. During the rest of the year water stock decreased.

Salt balance was positive as well as negative depending on water supplies. Main salt mass comes with irrigation water (10.97 -11.65 t/ha). Salt removal was executed through collector drainage network and by underground outflow. To stabilize salt content is necessary to achieve drainage outflow to water supply ratio equal to 0.26 and water supply to total evaporation ratio 1.43 -1.45.

Groundwater lowering rate depends on distance from well: maximum means (17 -19 cm/day) was observed on 200 m from well. On distance of 450 -500 m rate was 4,5 -8 cm/day, 1200 -1400 m - 3.3 5.7 cm/day. Irrigation water salinity was 0.62 -1.9 g/l. Pumped water salinity was 0.62 -1.66 g/l. It increased since 1979 till 1988 from 0.94 to 1.38 g/l. After irrigation was started groundwater salinity decreased. 2 -3 irrigations by norms 2200 -3200 cu.m/ha with long irrigation interval (30-45 days) under permanent VDS operation led to unsaturated zone withering. Average water stock to beginning of irrigation was 60 -65 % FFMC. It was found that salt accumulation occurred within the growing season (1.03 -1.54), and within non-growing period (0.92 -0.99). Desalinization process occurred under coefficient of annual salt accumulation 0.68 -0.95. For given conditions half-hydromorphic reclamation regime within growing season and automorphic within non-growing period are recommended. Optimal reclamation regime creation and lands desalinization provision is organized by the following VDS operation regime: average annual useful operation coefficient 0.60 -0.70 and pumped water volume on gross area 2.6 -2.9 t. cu.m/ha.

H	Suggested key-words		
1	Vertical drainage system	4	Soil salinity
2	Irrigation water salinity	5	Soil water-salt regime
3	VDS efficiency	6	Well optimal operation regime

I	Most recent publications (maximum 3)			
1	Author(s): M. Djurayev, G. Yuldashev			
	Title: Soil water-salt regime on background of vertical drainage under conditions of SyrDarya lower reaches.			
	Publication details: Soil water-salt regime peculiarities under thin cover sediments conditions within Kyzilkum scheme.			
	Year of publication: 1988	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"/>