

REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

QUESTIONNAIRE

A	Project title: Irrigation Regime and Components of the Rice Irrigation Norm with Horizontal Drainage in Kazalinsk Irrigation Scheme
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B	Topic n° : 1	Sub-topic n°: 2
1)	1	Technical field n°: 1
2)	Category n°: 01	

C	Project location		
	Country: Republic of Kazakhstan	Area: 106,5 ha	
	Kzyl-Orda province; Kazalinsk district, «XXII partsyezd KPSS» state farm		

D	Duration of the project:		
	Year in which the project was started: 1971	Project completed: 1975	
		Dates of Expertise: 1975	

E	Organizations and technical staff involved			
1	Supervisor/project coordinator: Victor Matveevich Petrunin			%
	Organization: Kazakh Research Institute of Water Management (KazNIIVKH)			Staff resources 50
	Address: 484022, Taraz, K.Koygeldy 12			
	telephone:	fax:		
	E-mail:			
	Other counterparts:	Organizations	Surname	First name
1	KazNIIVKH, Marklen Bazhenov			50 %
2				%
3				%
4				%
	Other collaborators:			man-years

F	Funding agencies	
	Full name or acronym	Percentage of project finance provided
1	Ministry of Water Management	100 %
2		%
3		%

G	Summary of research project
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1 *Objective and technical fields:*

Improvement of water resources use of the Syr Darya river. Determination of the optimal irrigation norm and irrigation regime of rice on Kazalinsk irrigation scheme. Soil salinity control through horizontal drainage and rational irrigation regime.

2 *Scientific and technical approaches:*

Guaranteeing the favorable for rice water and salt soil regime with optimal combination of an irrigation regime and degree of land drainability. The experiment included selection of tested parameters of reclamation processes and grounding the optimal water-salt soil regime of rice fields.

3 *Environment characteristics:*

Climate is sharply continental. Average annual temperature is 8⁰C, temperature in July is 26⁰C, temperature in January is - 11,3⁰C. Sum of positive temperatures (when t >10⁰C) is 3524-3850⁰C. The duration of a frost-free period is 170-180 days. Precipitation is 104-132 mm. Air humidity deficit in summer reaches 18,1-27,1 mb. Evaporativity is 1737 mm.

The scheme is situated within the modern delta of the Syr Darya river which is a corrugated plain with small inclination in the direction of the Aral Sea (0,00015). In the south of the scheme there is Kara Kum desert, in the north there is Kzyl Kum desert. Delta is made of sand-clay quaternary deposits. Depth of a negative confining bed varies from 3-5 m to 10-15 m. Average depth of a negative confining bed is 7-8 m. Thickness of a water-bearing layer varies from 1-2 m to 5-7 m. On irrigated plots the depth of water table is 1-3 m. The source of ground water increment is infiltration of irrigation water. Coefficient of permeability is 0,5-1 m/day (fine-grained silty sand), 1-5 m/day (small-grained sand). Ground water salinity varies from 3 g/l on irrigated plots to 10-20 g/l on closed sinks. Water with salinity of 3 g/l is of a sulphate type of salinity. The distinctive feature of soils on the scheme is high stratification and high silt content, they have low (7-14 mg-equiv. Per 100 g of soil) absorption capacity. Salt content in 1 m soil layer is 72 t/ha. Coefficient of permeability is 0,2 m/day, volume weight is 1,46 g/cm³, porosity is 50%.

4. *Parameters of Pilot Projects and Technical Solutions:*

Rice rectangular checks of Krasnodar type 180-200 m wide with the area varying from 13,6 to 19,8 ha. The area of rice checks is 1,5-2,5 ha. Check ditches are 450-1200 m long. Specific length of irrigation canals is 54-62 m/ha, flow rate of check ditches is 100-250 l/sec. (in the period of initial flooding). Length of release and contour canals is 43-48 m/ha. Depth of drains is 1,8-2 m, drain spacing is 180-400 m. Efficiency of an internal network of canals is 0,76.

5 *Methodology:*

Field studies on determination of parameters of an irrigation regime and rice irrigation norm components, study of a water-salt soil regime on rice fields and water-salt balance elements were carried out. Systems analysis of the results of studies was made. The testing-production plot was provided with necessary measuring and accounting equipment.

6 *Results:*

Studies showed that the rice irrigation norm varied from 22660 m³/ha to 18400 m³/ha. Its main efficient components were evaporation from the water surface of a rice field equal to 4960-4350 m³/ha (20,4-23,8% of the rice irrigation norm) and transpiration of plants equal to 4790-4180 m³/ha (19,5-23,0% of the rice irrigation norm). On the average for 5 years total water consumption (evaporation plus transpiration) was 44% of an irrigation norm. The rest 56% included soil saturation (9,1%), vertical and lateral filtration (24,3%), surface release (22,6%). The last value decreased from 6340 m³/ha in 1972 to 2980 m³/ha in 1975 (from 29,7% to 16,3%). Average rice irrigation norm was 20670 m³/ha.

Rice irrigation regime for the operation period (on soils with no and slight salinity) was the following: initial check flooding was made right after rice planting. After water layer of 10-15 cm had stayed on the field for 4-6 days, after water supply was cut off. On sprouting checks were

flooded again with a water layer 10-15 cm deep. By tillering of plants water layer had been reduced down to 5 cm and maintained at this level till the end of the stage. Till the stage of milk ripeness the water layer was maintained at the level of 10-15 cm deep. Water supply to checks was cut off during the stage of full milk ripeness. It should be said that on the testing-production plot a fast-ripening rice variety «Dubovsky 129» was cultivated with the following development stages: planting was on May 20, sprouting was on May 30, tillering was on 25 June, peak tillering was on July 15, young panicle formation was on August 1, milk ripeness was on August 15, wax ripeness was on August 25, full ripeness was on September 5.

Analysis of water balances of the testing plots with a drain spacing equal to 200 m (in the optimal variant) showed that the main balance income was duty of water which during 5 years of studies decreased from 23820 m³/ha in 1971 to 19520 m³/ha in 1975. Precipitation in all the years of studies did not exceed 70 m³/ha or 0,3% of the total balance income. Balance expenses were the following: soil saturation varied from 1480 to 2140 m³/ha (from 6,9 to 11,6% of the total balance expenses), evapotranspiration varied from 8640 to 9750 m³/ha (40,3-46,7%), vertical filtration varied from 2240 to 3090 m³/ha (11,5-13,6%), drainage outflow varied from 2210 to 2710 m³/ha (10,3-12,7%), surface release varied from 2980 to 6340 m³/ha (16,3-29,7%). Water diversion from rice rectangular checks decreased from 8950 m³/ha (42% of an irrigation norm) down to 5350 m³/ha (29,3%), on the average for 5 years of studies it was 5900 m³/ha (34,6%).

The main salt income was with irrigation water - 21,6-28,3 t/ha (average for 5 years - 24,7 t/ha). With fertilizers only 0,2 t/ha were brought in which is less than 1% of the balance income. Salt removal was: with filtration waters - 15,9-19,4 t/ha (17,7 t/ha), with drainage outflow - 14,6-16,7 t/ha (15,7 t/ha), with release waters - 6,7-10,3 t/ha (8,4 t/ha), with harvest - 0,6-0,7 t/ha (0,6 t/ha). The total salt income to the testing plot was 21,8-28,5 t/ha (24,9 t/ha), salt removal was 40,0-46,2 t/ha (42,4 t/ha). Salt content in an aeration zone after rice growing decreased from 101,2-149,6 t/ha at the beginning of a growing season to 81,3-127,5 t/ha (109,7 t/ha) at the end of the season. Rice yield for the years of studies was 4,29-4,82 t/ha exceeding designed yield.

H Suggested key-words			
1	Rice crop rotation	4	Horizontal drainage
2	Irrigation regime	5	Volume of drainage
3	Water-salt balance	6	Efficiency of drains

I Most recent publications (maximum 3)			
1	Author(s): Marklen Gaysaevich Bazhenov, Mingash Kharisovich Sarsenbaev		
	Title: Regulation of a water-salt regime of lands of rice irrigation schemes. 8 printed pages.		
	Publication details: Existing methods of control over water and salt regime of lands of rice irrigation schemes are considered; ways for their improvement on the basis of engineering measures are suggested according with modern scientific and technical achievements.		
	Year of publication: 1979	free access <input checked="" type="checkbox"/>	restricted <input type="checkbox"/> confidential <input type="checkbox"/>
2	Author(s): Victor Matveevich Petrunin and others		
	Title: Recommendations on rice irrigation		
	Publication details: Environmental conditions of rice-growing regions of Kazakhstan and agrobiological rice requirements are described. Rice irrigation regime on lands with no and slight salinity is described in detail, measured values of rice irrigation norms and hydromodulus are shown.		
	Year of publication: 1977	free access <input checked="" type="checkbox"/>	restricted <input type="checkbox"/> confidential <input type="checkbox"/>