

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)
<p><i>1 Objective and technical fields:</i></p> <p>Irrigated lands water-salt balance management by means of perfect types of drainage. Territory zoning according to vertical drainage applicability.</p>
<p><i>2 Scientific and technical approach:</i></p> <p>Groundwater level support and reclamation regime management on salinized lands. Irrigated land's water-salt regime management.</p> <p>Meaning: Development of principal background for perfect types of drainage applicability for reclamation purposes and Golodnaya Steppe zoning according to their applicability.</p>
<p><i>3 Environment characteristics:</i></p> <p>Annual precipitation is 202 - 425 mm. in summer temperature is 27.8 °C. Evaporativity is 1500 mm which exceeds 4-7 times precipitation. Relative air humidity is 70 - 80 %, in summer it decreases down to 25 - 40 %.</p> <p><i>Geomorphology:</i> diluvial - proluvial and alluvial sediments.</p> <p><i>Lithology:</i> quaternary depositions (80 - 500 m).</p> <p>Cover loam thickness is 3 - 40 m. Its permeability coefficient (kp) is 0,02 - 3,0 m/day, aquifer kp = 5 -100 m/day. Groundwater level was from 1 -3 to 5 - 20 m (60-es). Salinity was from 1 - 5 to 18 - 36 g/l. Underground inflow is 300 - 3000 cu. m./ha; underground outflow is 350 - 4350 cu. m/ha.</p> <p><i>Soils:</i> sandy loam, light, middle and heavy loam. Easy soluable salt content is 0,3 - 2,5 %. Salinization type is chloride-sulphate.</p>
<p><i>4 Parameters of Pilot Projects and Technical Solitions:</i></p> <p>Golodnaya Steppe irrigated lands (near 700 th. ha) are located within the command zone of two canals: Kirov (area is 390 th ha, water supply is 240 cu. m/sec) and South-Golonostepsky (area is 450 th. ha, water supply is 350 cu. m/sec). Canals' efficiency within old developed zone is 0,6 - 0,65, with in new developed zone - 0,8.</p> <p>There are 1600 wells of vertical drainage in operation with total discharge 72,4 cu. m/sec. Drainage network extent is 22 th. km including 14.5 th. km of close drainage. Horizontal drainage outflow is 30 - 35 cu. m/sec.</p>
<p><i>5 Methodology:</i></p> <p>Regional investigations of natural reclamation peculiarities of the territory for its zoning according to vertical drainage applicability. Systems analysis for data processing was used.</p>
<p><i>6 Results:</i></p> <p>Investigations showed that drainage type selection should be based on certain factors:</p>

geomorphological, hydrogeological, soil-reclamation, technical-economic. All design development should be linked with irrigation regime and technique, irrigation system design and agricultural production.

Drainage system capacity is selected with regard to water-salt balance dynamics analysis according to optimal reclamation regime for given rayon.

Lithology of this rayon determines drainage system operation conditions, discharge and efficiency. On the base of lithologic zoning geofiltration schemes are established, which allow to calculate vertical drainage parameters. High importance is devoted to screen design and pumping equipment selection.

On the base of above principles Golodnaya Steppe territory was zoned, huge vertical drainage systems were constructed in Shuruzyak, Sardoba, Bayaut, Pakhtaara, Djetisay and Kirov districts. Total wells number is 1100 within the area of 316.8 th. ha. Total discharge is 5,1 - 23,0 cu. m/sec, drainage modulus are 0,11 - 0,3 l/sec/ha. Main parameters of cover loam were characterized by the following factors: 1) geofiltration parameters - cover loam thickness is 15 - 45 m; lithology - middle and heavy loam, somewhere - clay and sandy loam with permeability coefficient $k_p = 0,03 - 0,1$ m/day. Pumped layer is gravel - pebble with transmissivity 300 - 5000 sq. m/day.

2) Hydraulic parameters - groundwater depletion rate - 1,5 - 2,5 cm/day; overflow intensity 0,0025 - 0.005 m/day.

3) Soil-reclamation parameters - soil distribution nature - unsaturated zone is salinized (Shuruzyak district), cover loam is salinized (Sardoba district), all loam thickness (Bayaut district); salinization type - chloride-sulphate or sulphate; Salinization level on solid residue 0,5 - 4 %, on chlorine content 0,03 - 1,2 %; water specific yield is 0,06 - 0,08.

Main parameters of cover loam (Pakhtaara, Djetisay and Kirov districts) are the following:

Total area is 174 th. ha. Soils - light and middle loam and sandy loam. Thickness is 15 - 40 m. $k_p = 0,1 - 0,15$ m/day. Hydraulics: groundwater depletion rate is 2,5 - 35 cm/day; overflow coefficient is 150 - 450 sq. m/day; overflow intensity is 0,0025 - 0,007 m/day.

Soil reclamation: easy soluable salts are distributed all over cover loam thickness with two maximum : 1,5 - 2,5 and 5 - 15 m. Solid residue is 0,5 - 1,8 % chlorine is 0,03 - 0,3 %. Water specific yield is 0,08 - 0,1. Salinization type is sulphate and chloride- sulphate.

On the base of water-salt balance and regime analysis was found that after vertical drainage putting in operation stable process of desalinization with 15 - 20 t/ha salt removal from unsaturated zone under irrigation norm 6000 cu. m/ha and autumn-winter leaching by rate 2000 - 3000 cu. m/ha is observed. Infiltration water desalinizing discharge in this case is (total water supply + precipitation - evapotranspiration) is 900 - 2000 cu. m/ha.

During 5-7 years of vertical drainage operation share of middle and strongly salinized lands decreased from 43 to 4 %.

H Suggested key-words			
1	Vertical drainage system (VDS)	4	Soil water salt regime
2	Territory zoning on type of drainage	5	Leaching regime of irrigation
3	Geofiltration schematization	6	Desalinization rate

I Most recent publications (maximum 3)	
1	Author(s): N. Reshetkina, K. Yakubov
	Title: Vertical drainage

	<p>Publication details: Irrigated lands groundwater formation specific features with regard to technically perfect irrigation systems.</p> <p>Vertical drainage system's design, construction and maintenance experience is summarized. Principles of Golodnaya Steppe zoning on vertical drainage applicability are considered.</p>		
	Year of publication: 1978	free access <input checked="" type="checkbox"/>	restricted <input type="checkbox"/> confidential <input type="checkbox"/>
2	Author(s):		
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