



<b>G</b>	<b>Summary of research project</b>
<p><b>1 Objective and technical fields:</b>  Assessment of desalinizing and water lowering effect of vertical drainage.  Objectives: Water use improvement and soil water-salt regime management..</p>	
<p><b>2 Scientific and technical approaches:</b>  Field investigations were dedicated to wells parameters determination and improvement for land productivity increase.</p>	
<p><b>3 Environment characteristics:</b>  Climate is continental.  Annual average air temperature is 13 -14 °C, maximum is 45°C (July ), minimum is 30 °C (January-February). Frost -free period duration is 210-220 days. Annual precipitation is near 300mm, including 4% (summer) , 15-20% (autumn), 30-40% (winter) and 40-50% (spring). Relative air humidity in winter is 70-74%, in summer -30-35%.  Evaporativity is 1420-1700mm.  Geomorphology: SyrDarya river delta's alluvial sediments (northern part) and depositions of cones of withdrawal (central and southern parts ).  Relief is slightly corrugated with slope 0,0001 -0,0002.  Lithology: Two -layers quaternary sediments: Top loam (25-30m; permeability 0,05m/day) and fine-grained sand (15-20m; permeability 5-10 m/day): separating layer is loam (15-25 m; permeability 0,03 m /day); second aquifer is represented by small -grained sand (40-50m; permeability 10-12 m/day). Before land development in 1964 groundwater level was 10-15 m , after development it increased up to 1,5-2 m. Groundwater is highly salinized by chloride-sulphate and sulphate-salts. Total dissolved solid (TDS) content is for the first aquifer 16-18 g/l, for the second one 5-11 g/l. Artesian head of the first aquifer is 0,5-09 m lower than groundwater level</p>	
<p><b>4 Projects and Technical Solutions:</b>  Experimental site by area of 551,9 ha. Is located within central part of the state farm №17.  Main crop is cotton. Water supply is performed from canal ПП1-4 and its distributors. Canal is lined by concrete. There are 3 collectors within the site. 8 vertical drainage wells are constructed well's depth is 60-104 m, diameter 325mm, screens are splitted with gravel treatment. Well discharge is 20-50 l/sec.</p>	
<p><b>5 Methodology:</b>  Field investigations of water and salt movement in cover loam and groundwater to depth of 100 m. For the purpose 22 sets of observation piezometers were established with screens with in cover loam, the first and second aquifer on depth of 10,40,63-75m and 44 single piezometers with depth of 10-12m. Regular observations and sampling were carried out. Multicriterial analysis was used to process data obtained.</p>	
<p><b>6 Results:</b>  Within growing season water supply was performed by 3 irrigations by irrigation norm 6760-8950 cu.m/ha. Since 1968 soils were transited from strongly and middle salinized to slightly and non-salinized. Vertical drainage system (VDS) consisting of 8 wells is positioned i the center of the site. VDS provided 0,38 mln cu.m/year water removal and 3200t/year salt removal. Analysis of water-salt balances showed, that sustainable leaching regime of irrigation was established. Water supply to the site varied within 9600-11450 t.cu.m/ha under, total evaporation was 5500-6600 t.cu.m./ha. Salt removal was 66,1 t/ha per year. This provided sustainable desalinization of sediments and decreased salt stock on 175,5 t/ha within 3 years. The following system's parameters are determined:  - cover sediment permeability coefficient PC = 0,046 m/day;</p>	

- water capacity by gravity  $\mu = 0,08$ ; overflow parameter  $\beta=258\text{m}$ ;
- first aquifer permeability coefficient  $PC= 6,5\text{m/day}$ ; transmissivity  $T=136 \text{ sq.m/day}$ ; elastic water capacity  $\mu = 1,09 * 10^{-3} \delta/\rho$ ;
- separating layer permeability coefficient  $PC= 0,005\text{m/day}$ ;
- second aquifer permeability coefficient  $PC= 10 \text{ m/day}$ ; elastic water capacity  $\mu= 1,5 * 10^{-4} \delta/\rho$ ; piezoconductivity  $a^* = 1,0 * 10^5 \text{ sq.m /day}$ ;
- infiltration norm: average annual according to balance -  $0,0017 \text{ cu.m/day. sq.m}$ ;
- well discharge within the first aquifer  $Q=17-20 \text{ l/sec}$ ; subsidence  $S=17-20\text{m}$ ; distance between wells  $\delta= 800-900\text{m}$ ;
- well discharge within the second aquifer  $Q=30-40 \text{ l/sec}$ ; subsidence  $S=20-25\text{m}$ ; distance between wells  $\delta= 1200-1400\text{m}$ ;

Active hydraulic interrelation between 2 aquifers and intensive water subsidence are defined. Within 5 years of operation groundwater level decreased: 1-2m (from 250,8 to 38,5 ha), 2-3m (from 258,0 to 163,2 ha), 3-5m (increased from 38,6 to 35,2 ha). Groundwater level to the end of observation was 5,5 m within cover sediments, in piezometers depth with 40m - 8,5; depth 60-70m -12m. Pumped water salinity from the first aquifer increased from 16,1 to 20,7 g/l , within second aquifers from 5,6 to 7,4 g/l. Groundwater desalinization rate was 8% per year. Cotton yield within 5 years increased from 2,2 to 3,5 - 4,0 t/ha. Economic efficiency of vertical drainage was 778 rouble/ha.

H Suggested key-words			
1	Vertical drainage system	4	Groundwater desalinization
2	Soil water-salt balance	5	Infiltration rate
3	Pumped water salinity	6	

I Most recent publications (maximum 3)			
1	Author(s): N. Kalyujnaya		
	Title: Irrigation influence on groundwater level dynamics under vertical drainage.		
	Publication details: Observations of vertical drainage results. Wells' parameters, hydrogeological parameters of water -bearing thickness, annual infiltration rate.		
	Year of publication: 1973	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"/>
3	Author(s):		
	Title:		
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