

G	Summary of research project
<p>1 Objective and technical fields: Creation of optimal conditions of area drainability. Objective: soil water-salt regime and ecological -reclamation processes management, providing irrigated land productivity improvement and water saving on background of vertical drainage.</p>	
<p>2 Scientific and technical approaches: Prevention of salinization is based on territory drainability strengthening and salt removal from soils by means of leaching and groundwater pumping. Provision of water-salt regime management optimization. Meaning: development of the set of measures on ecological -reclamation processes management to save water and improve land productivity.</p>	
<p>3 Environment characteristics: Climate is arid with insignificant precipitation (125 mm); evaporativity is 2075 mm, average annual temperature is 14.2 -15.1 °C. Relief: Zerafshan flat valley with slope 0.0005 to south -west. Lithology: quaternary sediments represented by cover loam (to 15 m) and gravel -pebble deposition with permeability coefficient (K_p) 40 -45 m/day. Cover consists of light and middle sandy loam with $K_p = 0.5 -1.0$ m/day. Groundwater overflow intensity is 0.5 -0.6 m/day. Soil salinization occurred mainly within surface layer (0.2 -0.5 m) and varies within 0.5 and 1.0 %. Hydromorphic soils of ancient irrigation occupy 80 % of territory. Groundwater level is 2 -3 m within dry years and 0.5 -1.2 m within wet ones. Groundwater salinity within cover loam is 2 -5, 5 -10 and more g/l and 0.8 -2.0 g/l within gravel -pebble depositions. Under natural conditions neither natural under-ground outflow nor existing open drainage could not provide favorable soil water-salt regime and salt's stock removed and accumulated within upper cultivated layer (0.2 -.5 m). Cotton yield did not exceed 1.3 -1.4 t/ha (1959 -1960).</p>	
<p>4. Parameters of Pilot Projects and Technical Solutions: Total area of Bukhara oasis is 245 t/ha. Pilot area is 51.9 t/ha. Vertical drains' depth is 25 -45 m., specific yield is 3.1 -13 l/sec/m; diameter is 426 mm. Collector -drainage network density is 8.46 m/ha, drainage outflow is 500 -600 cu.m/ha. Till 1977 232 wells were constructed.</p>	
<p>5 Methodology: Field observations on water, salt and all water-salt balance elements of unsaturated zone, groundwater, cover loam and irrigated lands as a whole. Balance sites were established with area of 520 ha, where observations on soil water -salt regime, groundwater and elements of water -salt balance were carried out. As a methodology systems analysis was used.</p>	
<p>6. Results: Before vertical drainage system (VDS) construction (1964 -1965) groundwater level was 1.0 -2.4 m and its salinity was 5.0 7.0 g/l. Salinity type was sulphate -chloride -sodium. Open horizontal drainage with density of 8.46 km/ha and depth 2 -3 m was covered by vegetation and could not provide land drainability (500 -600 cu.m/ha/year).It was proved that further development is possible only on the base of vertical drainage. 250 wells are in operation providing reclamation for 51.9 th.ha of land. Each well serves in average: in Vabkent district -260 ha, in Bukhara district -193 ha, in Kagan district -185 ha. Well's yield is 40 -45 l/sec (Vabkent district) , 25 -30 l/sec (Kagan and Bukhara district). Due to VDS operation areas with groundwater level 1.4 -1.5 m decreased to 15 -20 % and areas with level 1.5 -3 m increased to 40 %. In autumn groundwater level was 2.7 -3.2 m. This level allowed to use leaching regime of irrigation by norm of 6.0 6.5 th.cu.m/ha and leaching rate of 2.5 -3.0</p>	

th.cu.m/ha for slightly salinized and to 6.0 th.cu.m/ha for strongly salinized soils. Water supply plus precipitation to total evaporation ratio in Vabkent district was 1.03 -1.25, in Bukhara district - 1.01 -1.21; in Kagan district 1.21 - 1.23. Negative water-salt balance was formed under irrigation leaching regime with salt removal in Vabkent district -5.13; Bukhara district -5.46 and Kagan district -9.5 t./ha. Drainage modulus was 4.8; 3.9 and 3.1 th.cu.m/ha respectively.

Within unsaturated zone water-salt balance was different. During non -growing period at expense of winter -spring leaching and rainfall intensive soil desalinization occurred; within growing season -salt accumulation occurred. Annual balance was negative with salt removal 11t/ha.

-Salt movement process became more dynamic;

-Groundwater salinity within intensively irrigated lands was 1.2 -3.0 g/l;

-Salt removal from cover loam by drainage systems in 1970 was 18 t/ha (with regard to underground outflow -23 t/ha); in 1971 -14.6 and 19.6 t/ha respectively;

-non-salinized and slightly salinized areas constantly increased. Till 1971 they increased 10 times to compare with 1960 (before vertical drainage construction).

All this promoted land productivity improvement and agricultural crops yield growth. By 1976 cotton yield was 3.0 t/ha or 510 th.t for Bukhara oasis against 314 th.t in 1965. Active water exchange zone under vertical drainage is 25 -70 m and salt exchange zone encompasses cover loam thickness

H	Suggested key-words		
1	VDS	4	Water -salt balance
2	Pumping regime	5	Leaching regime of irrigation
3	Soil water -salt regime	6	Desalinization rate

I	Most recent publications (maximum 3)			
1	Author(s): N. Reshetkina , K. Yakubov			
	Title: Vertical drainage			
	Publication details: Field investigations results on vertical drainage efficiency in soil desalinization, soil water - salt balance and groundwater management in Bukhara oasis are considered.			
	Year of publication: 1978	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:			