

Study of possibility and efficiency of saline water use for irrigation and soil leaching in Golodnaya and Djizak Steppe.

Objectives: Management by collector-drainage water volume and salinity.

2 Scientific and technical approach:

Study of collector-drainage water chemical composition and soil solution composition change under irrigation by saline water in order to use it for irrigation in Djizak Steppe.

3 Environment characteristics:

Climate is continental. Average annual temperature is 14.4-15⁰C, maximum is 40⁰C, minimum is -30⁰C. Frost-free period duration is 210-230 days with sum of temperatures 4600-4700⁰C. Wind speed is up to 6 m/sec. During growing season average air temperature is 23-24⁰C. Evaporativity during growing season is 1200-1300 mm, annual value is 1500-1700 mm. Humidity deficit is 1100-1200 and 1200-1400 mm respectively. Annual precipitation is 300 mm. Relative air humidity within winter-spring period is 70-80 % decreasing in summer down to 25-30 %.

Relief formation is determined by permanent and temporary streams from Turkestan spine. It is pluvial plain overlaid by modern sediments.

Soils: light serozem, meadow-serozem, serozem-meadow, solonets. Main soil properties are determined by its mechanical composition and gypsum content.

Level of soil salinization is different from non-salinized to strongly salinized. Groundwaters are saline.

4 Parameters of Pilot Projects and Technical Solutions:

Observations on irrigation, drainage and released water salinity over 26 points with monthly sampling for chemical analysis content of HCO₃, Cl, SO₄, Mg, P₂O₅ and nitrogen as ammonium was determined. Study of soil solution composition dynamics under influence of irrigation by saline water was carried out within the lots by area of 5x5 m in state farm 10^a.

5 Methodology:

Territory of study was 10000 ha (field test) and irrigated lands of Golodnostepsky and Djizak districts. Laboratorial tests on models within the tubes with diameter 3 cm and height near 100 cm were executed.

Distilled water as a control and salt solutions of different composition and concentration (2-16 g/l) were used.

6 Results:

Data on collector-drainage water discharge and salinity allowed to draw to conclusion about negative salt balance which was formed within new irrigation zone. Salt removal was 450 th. t or 1.7 t/ha of toxic salts.

Study of soil solution composition dynamics under saline water irrigation witnesses about increasing humus removal. Waters of sulfate-sodium composition increase humus solubility and its losses with filtration water increase by 2-3 times.

Calcium content in soil solution after displacing of 3/4 gravity-mobile part of solution (900-4300 cu.m/ha) and 6-7 portions (2.5-3.0 th. cu.m./ha) decreases.

For carbonate serozems sulphate-calcium content rise up to 16 g/l does not influence on calcium removal, but under its concentration rise by 4 times calcium removal increases by 1.5-2 times.

Absolute meanings of highest concentrations are 40-150 mg.ekv/l. Under irrigation by saline water with sodium salts content 4 g/l calcium content increases up to 40 mg.ekv/l (initial content is 14 mg.ekv/l).

Under sodium salts content 16 g/l calcium content rises up to 137 mg.ekv/l but under similar content of sodium-sulphate does not exceed 45 mg.ekv/l. Lost part of calcium constitute 20-30 % of initial content.

Thus, saline water use, even if its salinity does not exceed 1-2 g/l, provokes calcium removal from

absorbing complex and leads to soil physical-chemical and water-physical properties deterioration. On the basis of experimental data (field and laboratorial) possibility of saline water use for irrigation and leaching under conditions of Golodnaya and Djizak Steppe determines coming out the following provisions:

1. Water with salinity more than 2 g/l is not recommended for irrigation of ordinary soils of medium and heavy mechanical composition.

2. Water with salinity 1-2 g/l promotes salt accumulation in soils.

Under-irrigation within growing period provokes sodium intrusion in soil absorbing complex (5-10 % of volume); organic water content decreases down to 0.7 % of dry soil weight.

In order to restore during winter-spring period favourable composition of bases absorbed with calcium predomination it is recommended to carry out water-charge irrigations in autumn and early winter.

During the growing season it is necessary to support downward flow within the unsaturated zone, i.e. leaching regime of irrigation.

3. Water with higher salinity can be used for irrigation of light (sandy loam and sand) soils under conditions of natural and artificial drainage provided. Top permitted salt concentration in irrigation water should be determine by experiment for each crop and soil. Irrigation by saline water can be performed under leaching regime of irrigation.

4. Water with salinity 3 g/l and more can be used for soil leaching with additional leaching by fresh water. Taking into account that under influence of irrigation active potassium removal is accelerated. Leaching by saline water can be recommended for soils with high reserve of calcium, for instance, gypsum-bearing salines widely spread in Golodnaya and Djizak Steppe.

5. Leaching of gypsum-bearing soils within the stripe along SGC can be hardly performed even by fresh water. Process of desalinization is stretched for 3-5 years. Thus before these soils leaching a system of agrotechnical measures (deep loosening of soil, etc.) should be applied.

H	Suggested key-words		
1	Saline water	4	Leaching regime
2	Allowed concentration	5	Toxic salts
3	Salinization processes	6	

I	Most recent publications (maximum 3)			
1	Author(s): I. Shafarost			
	Title: Technical project of the second stage of irrigation and development of Djizak Steppe.			
	Publication details: Recommendations on saline water use for irrigation and land reclamation are given. Diagram for saline water applicability assessment for irrigation is developed.			
	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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