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Assessment Of Irrigation Suitability Of Collector-Drainage Water And Its Use In The Cultivation Of Salt-Resistant Crops

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Abstract: The article examines the results of research on the cultivation of forage crops using mineralized collector-drainage water for irrigation. Sorghum (Uzbekistan-18 variety), sorghum-sudan grass (Chimbay-8 variety), and African millet (Khashaki-1 variety) were planted.

Keywords: Collector-drainage waters, salt-tolerant agricultural crops, sorghum (Uzbekistan-18 variety), sorghum-sudan grass (Chimbay-8 variety), and African millet (Khashaki-1 variety).

INTRODUCTION:

Currently, in the vast irrigated area of Central Asia,

38-40 km3 of returning collector-drainage waters are formed, which constitutes 1/3 of all available surface water resources in this region. In the Republic of Uzbekistan, 20-22 km3 of collector-drainage waters are formed across all administrative territories. Literature data from many irrigation specialists indicate that these waters are reused for various salt-tolerant crops.

Therefore, during 2015-2017, we (ITIITI and Karakalpak State University named after Berdakh) conducted field research on the cultivation of salt-tolerant crops: sorghum, sorghum-sudan grass, and African millet.

Research objects. The experimental plot of the old saxaul nursery is located in the Kazakhdarya farm, near the dried-up "Togiz Tura" lake in the Muynak district of the Southern Aral Sea region, at the end of the KS-1 collector.

Due to the relevance and important practical significance of using mineralized water for irrigating various forage crops, experimental production plots were established, where research was conducted on the cultivation of forage crops using mineralized collector-drainage water for irrigation. Sorghum (Uzbekistan-18 variety), sorghum-sudan grass (Chimboy-8 variety), and African millet (Hashaki-1 variety) were sown, and the total area occupied by each crop was 0.27 hectares. Water for irrigating fodder crops was taken from the nearby KS-1 collector.

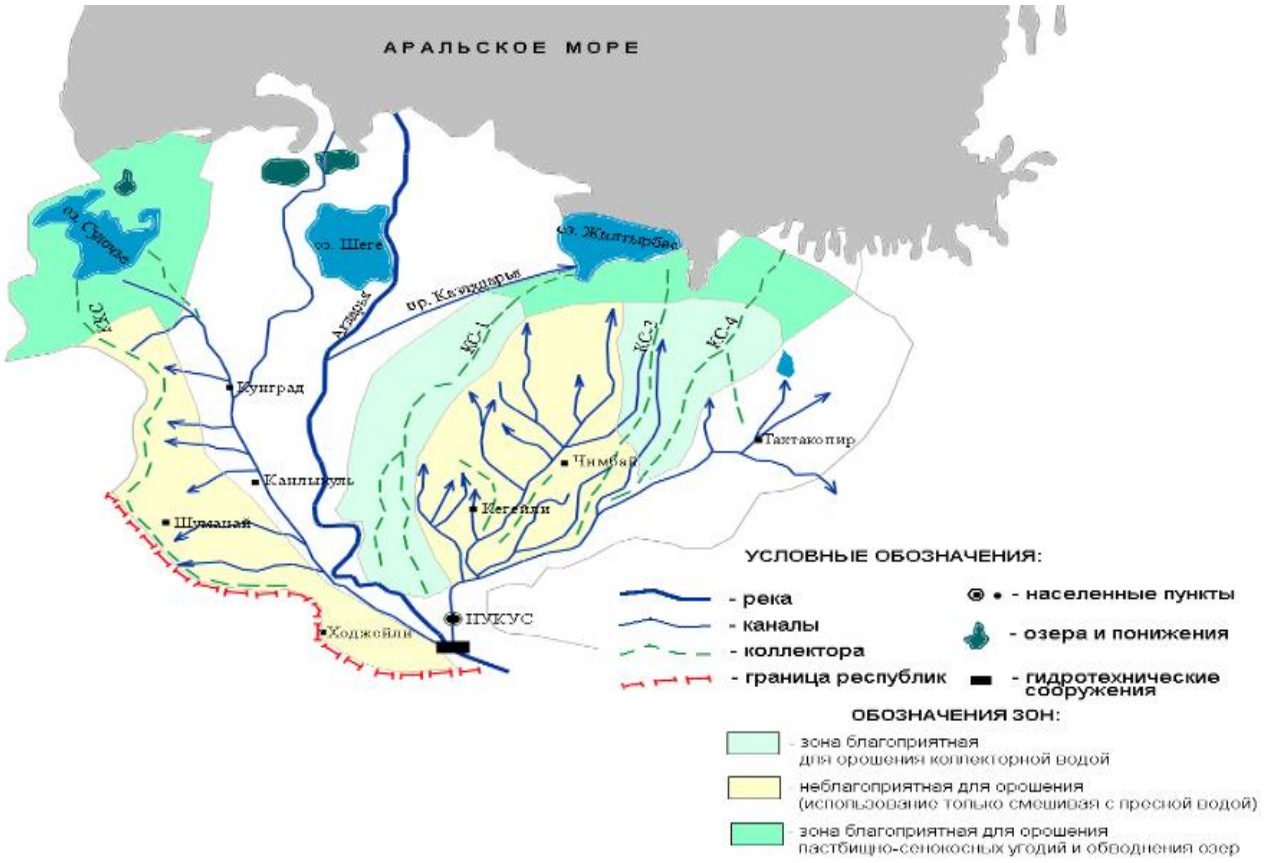

Figure 1. Schematic map of the Southern Aral Sea region showing the main collectors

METHOD

The studies were carried out using generally accepted hydrological, hydrochemical, and hydrometric methods. Soil salinity was determined by laboratory method.

During these studies, the mineralization and chemical composition of collector waters, dynamics of soil moisture, cycle of phenological observations on the growth and development of cultivated crops, accounting of supplied water, and dynamics of groundwater level and mineralization were also determined.

During the experiments, the mineralization of collector water varied from 2.02 g/l to 2.66 g/l. The chemical composition of the water was chloride-sulfate magnesium-sodium (CS-MN).

Depending on the type of irrigated crop, irrigation was carried out three to five times, with the irrigation rate varying from 2100 to 4000 m3/ha. The soils of the experimental plots consist of heavy soils: loamy and clayey soils predominate up to a depth of 2.5-3.0 m. The soil density varies within the range of 1.4-1.6 g/cm3 depending on the mechanical composition.

Analysis of soil samples taken from the experimental plots showed that, in general, the amount of nutrients in the soil is insufficient: the maximum amount of humus does not exceed 0.98% and is concentrated in the upper layer (0.20-0.40 m), and with increasing depth, it sharply decreases to 0.35-0.27%. During the growing season, the groundwater level in the experimental fields varied from 180 to 295 cm. The mineralization of groundwater varied from 7.58 to 11.02 g/l, with its main chemical composition being chloride-sulfate-magnesium-sodium (CS-MN).

Despite the higher mineralization of collector water compared to irrigation water, the average yields of sorghum, sorghum-sudan grass, and African millet on the experimental plot of the "Qozoqdaryo" farm differed only slightly: when irrigated with collector water, yields ranged from 30-37 c/ha; when sorghum was irrigated with fresh water, yields ranged from 32-40 c/ha; for sorghum-sudan grass irrigated with fresh water, yields ranged from 32-42 c/ha, and when irrigated with collector water, yields ranged from 25-40 c/ha.

As a result, the following conclusion was drawn: in conditions of irrigation water scarcity, collector

waters serve as an additional source for irrigation and can be used for irrigating salt-tolerant fodder crops (corn, sorghum, and others). Since sorghum is a more salt-tolerant crop than corn, it is more suitable to grow it for fodder areas when irrigated with collector waters compared to growing cereal crops. After harvesting, soils that required the use of collector water undergo preventive salt leaching.

Data on mineralization are presented in tabular form.

and the chemical composition of irrigation and collector-drainage waters is determined during the irrigation period of the experimental plot. The yield of cultivated crops is presented in Table 1.

Table 1.
Grain yield of cultivated crops, c/ha.

Years	Miner. coll.water (KS-1) g/l,	Chemical composition	Crop		
			Sorghum (Uzbekistan-18 variety)	Sorghum-Sudan grass (Chimboy-8 variety)	African millet (Fodder-1 variety)
2020	2.15	XS-MN	30.31	30.30	12.67
2021	2.22	XS-MN	30.77	30.77	12.33

At the conclusion of the conducted research, their economic efficiency and the amount of net profit obtained were calculated. The net profit from crops grown on 1 hectare (sorghum, sorghum-Sudan grass, African millet) amounted to 1,320,000 soums.

Recommendations for production: in conditions of freshwater scarcity

Practical research on the topic "Development of technology for growing seeds of fodder crops in the extreme conditions of the Southern Aral Sea region" was carried out on a farm in the Muynak district of the Republic of Karakalpakstan, Republic of Uzbekistan, for irrigating fodder crops using collector-drainage water, as well as for irrigating wild fodder crops (reeds and others) along collectors using the liman method. KS-1, KS-3, etc.

Figure 2. Harvest of sorghum (Uzbekistan-18 variety) and African millet (Fodder-1 variety) grown in the experimental field

It is necessary to continue such studies in the terminal sections of collectors KS-1, KS-3, KKS, GYUKK and others, but for this it is necessary to attract investments not only from domestic, but also from foreign specialists. This will make a significant contribution to mitigating the consequences of the Aral Sea crisis and improving the lives of the population in the Southern Aral Sea region.

CONCLUSIONS

The experimental plot is located at the "Qozoqdaryo" farm in the Muynak district of the Southern Aral Sea region, near Lake "Tag'iz to'ra," on the final section of the KS-1 collector. The main practical significance of using mineralized water for irrigating various forage

crops lies in the efficient use of available water under current water scarcity conditions. In this regard, experimental production sites have been established. As a result, the following conclusion was reached: in conditions of irrigation water deficit, collector waters serve as an additional source of irrigation and can be used for irrigating salt-tolerant forage crops (corn, sorghum, and others). Since corn is considered a relatively salt-tolerant crop, it is more expedient to grow it as fodder when irrigated with collector waters rather than sowing it for grain crops. After harvesting, the soil treated with collector water undergoes preventive washing.

At the conclusion of the conducted research, their economic efficiency and net profit amount were calculated. For example, in the "Qazaqdaryasi" farm of the Muynak district of the Republic of Karakalpakstan, under conditions of freshwater shortage, the expected net profit from 1 hectare of corn (Uzbekistan-18 variety) amounted to 1,320,000 soums. On the topic "Development of technology for growing seeds of fodder crops in extreme conditions of the Southern Aral Sea region," practical research was conducted on the use of collector-drainage waters for irrigating fodder crops, as well as on irrigating wild-growing fodder crops through dams in collectors KS-1, KS-3 and others.

REFERENCES

1. Tolepova Sh.B., Kurbanbaev R.E., Tleumuratova B.S. Dynamics of the volume and quality of return water in the lower reaches of the Amu Darya. //Bulletin of KKOAN RUz, 2004. - No. 1-2. - P. 46-49.
2. Usmanov A.U. On the issue of methodology for assessing the quality of drainage waters for their use in irrigation. // In the collection of scientific works. SANIIRI, issue 156. - Tashkent, 1978. - P. 55-63.
3. Utepov A.U. Use of mineralized waters for irrigation and flushing of meadow soils in the conditions of the northern zone of the KK ASSR. Abstract of the dissertation for Candidate of Agricultural Sciences.- Tashkent, 1984. - P. 21.
4. Chembarisov E.I., Lesnik T.Yu., Khojamuratova R.T., Vokhidova Yu.S., Uzakbayeva L.F. Collector-drainage waters of the Republic of Karakalpakstan. - Russia, Modern trends in the development of the agricultural complex: proceedings of the international scientific and practical conference / Solenoye Zaymishche village. FGBNU "PNIIAZ" 2016, pp. 186-191.
5. Chembarisov E.I., Khojamuratova R.T. Collector-drainage waters of the Republic of Karakalpakstan. - Nukus, "Bilim," 2008. - p. 57.