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ADAPTATION AND PROMOTION OF CLIMATE RESILIENT TECHNOLOGIES TO IMPROVE PRODUCTIVITY OF SALT AFFECTED LANDS BASED ON QUASI-REAL-TIME MONITORING SYSTEM

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Joint Uzbekistan-Japan SATREPS Project
"Development of innovative climate resilient technologies for monitoring and controlling of water use efficiency and impact of salinization on crop productivity and livelihood in Aral Sea region (Uzbekistan)"

SATREPS UZGIP project:
"Adaptation and promoting innovative approaches and climate resilient technologies for water management and optimal land use based on quasi-real-time monitoring, climate scenarios and value chain analysis in saline and drought-prone agro landscapes across Amu Darya River Basin"

GOALS AND OBJECTIVES

The overall goal of the SATREPS project is to increase ecosystem goods and services and increase food security by promoting innovative approaches and climate-sustainable technologies for water resources management and the impact of soil salinity in quasi-real time based on climate scenarios and value chain analysis on saline agricultural landscapes in the project area.

Specific objective: To facilitate the monitoring of crops, soils, salinization, water and land resources in quasi-real time using innovative approaches, GIS/RS tools and methods to identify/evaluate the benefits of halophyte and NCC cultivation, and value chain analysis in the selected polygonand control areas of the project, and their validation.

SATREPS UZGIP project:

“Adaptation and promoting innovative approaches and climate resilient technologies for water management and optimal land use based on quasi-real-time monitoring, climate scenarios and value chain analysis in saline and drought-prone agro landscapes across Amu Darya River Basin”

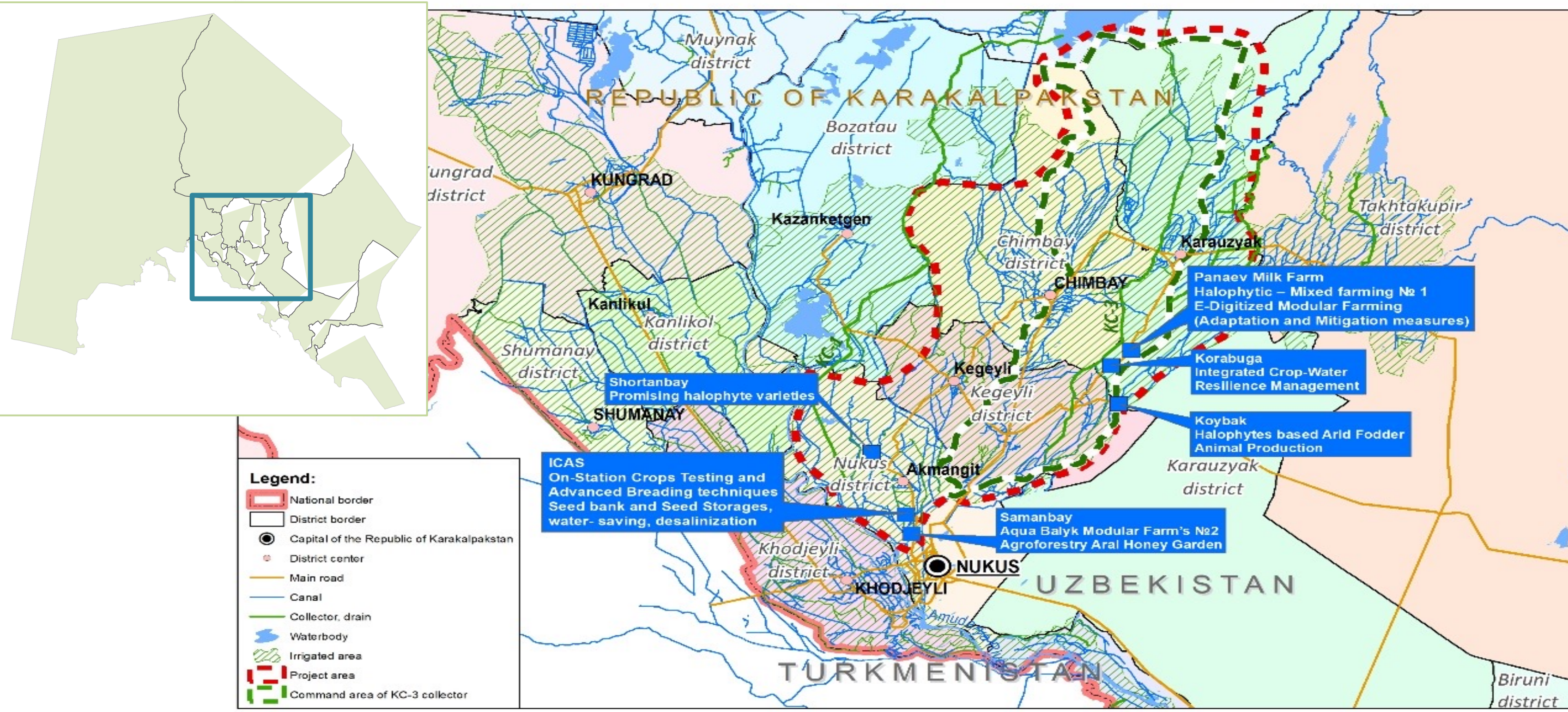
Adaptation and expansion of innovative approaches and technologies of climate-sustainable agriculture is a strategic priority and socio-economic importance for the effective restoration and reclamation of saline landscapes.

The Karauzyak district was selected on the basis of a multi-criteria analysis and GIS mapping of the land use system as the most vulnerable region due to water scarcity, lack of water for irrigation, soil susceptibility to salinization, erosion and widespread desertification, degradation and salt and dust storms that cause instability of agricultural production and food security.

LOCATION OF THE KARABUGA SITE

The experimental range “Karabuga” “Panaev Farms” is located on the southern of the Karauzyak district within the reclamation system of the KS-3 main collector. The average temperature in January is from -5 to -8 °C. The minimum temperature in winter is -38 °C. The average temperature in June reaches +26+28 °C, and in July and August +50°C. The average amount of precipitation is 100 mm per year. Humus content-1,25%. Salinity of the soil-1.2%, chloride type of salinization. Salinity of irrigation water-0,8-1,1 g/l

LOCATION AND FEATURES OF THE PROJECT AREA



Coordinates of the experimental field location N 42^0 51' 14. 5" E 59^0 56' 01. 6" Alt 62

Mulching seeding options

Karelinia caspica

Halimodendron Fisch

SATREPS UZGIP project: METHODOLOGY

The effective use of soil moisture and winter-spring precipitation combined with minimal soil preparation and the involvement of highly productive halophytic species is an innovative approach and method of restoring degraded arable salt affected lands.

Sowing of halophyte seeds was carried out in late autumn-early winter after the first precipitation and moistening of the upper soil layer by 15-20 cm, in order to obtain good rooting of halophyte seedlings. Before sowing, a laser layout of the land was carried out. The optimal seed depth was 1.0 – 2.0 cm for most halophytic species.

soil sampling

Experimental site

KARABUGA POLYGON IN THE «PANAEV FARMS" FARM, 2021

laser land planning

preparation of furrows for sowing

sowing seeds

preparation of irrigation systems

RESULTS of the 1st Year project (2022-2023)

Four scientific experiments are being conducted at the test site in Karabuga to test and adapt quasi-real monitoring of soil salinization, water-salt regime and observations of the growth of halophytes and non-traditional crops, as well as their screening, evaluation and verification, as well as analysis of the value chain as a whole.

The potential for closed-cycle halophyte farming of Circular halophytic mixed farming (CHMF) and non-traditional crops in cooperation with the Universities of Kyoto, Kobe, Chiba, Tottori, Kitakyushu and Mie.

Kochia scoparia

Chenopodium guinoa

Atriplex nitens

DISCUSSION

The best time for sowing halophytes is from November to February, in cold and wet weather. This was important in order to start sowing only after the establishment of cold weather, since ants and rodents hibernate and will not collect, store or eat seeds. In addition, the seeds undergo natural stratification at low winter temperatures.

Low air temperature stimulates seed germination in the field. *Atriplex nitens, Salsola schlerantha, Salicornia europaea,* annual and perennial *Salsola*s, *Suadeas species, Kochia scoparia* showed high seed germination, survival and rapid growth rate and biomass accumulation among 53 species of wild halophytes evaluated during two growing seasons with limited irrigation.

Psammogalophytes such as *Haloxylon, Calligonum, Aellenia subaphylla, Stipa, Agropyron, Kochia prostrata,* which are naturally well adapted to sandy soils, were poorly adapted to alluvial meadow soils of the southern Aral Sea region.

SOME INDICATORS OF DIFFERENT TYPES OF HALOPHYTES. PANAEV FARM, KARAUZYAK DISTRICT, 2022

Number of plants pcs/ha		Height cm		Productivity tn/ha	
15.V	29. IX	15.V	29.IX	Dry weight	seeds
Atriplex nitens					
140,200 / 100	120,900 / 85.7	60.6	180-185	4.70	1.2
Kochia scoparia					
130,200 / 100	110,000 / 84.4	42.6	150-155	3.60	0.8
Suaeda altissisima					
15,200 / 100	9,000 / 60.0	35	60-75	0.7	0.08

Note:
in the numerator, the number of plants
in the denominator of survival, %

CONCLUSIONS

The upper soil profile indicates a significant compaction of the soil, which negatively affects root growth and penetration of halophyte roots, especially at the stage of emergence.

Further studies are needed to assess irrigation needs, evapotranspiration, soil moisture, crop growth status, water scarcity, etc. Irrigation efficiency is evaluated, as well as places where halophyte conversion is desirable.

Scenarios for different land use conditions with different impacts of climate change and soil salinization are urgently needed in future studies to find the optimal cultivation technology to promote CHMF on saline agricultural land.

According to the results of research and screening in 2022, it is advisable to grow feed halophytes in saline areas: *Kochia scoparia , Atriplex nitens, Suadea*, the yield of feed halophytes is 3.5-6.0 t/ha of dry weight. The prospects of growing corn, sorghum, millet, alfalfa, amaranth and quinoa species have been established. When organizing irrigation farming in Karakalpakstan, it is advisable to use advanced irrigation technologies that contribute to saving irrigation water

Medicago sativa

Camphorosma Lessingii

Aeluropus littoralis

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THANK YOU!
WELCOME TO KARABUGA