Project Brief

Agriculture for Marginal Lands in Central Asia

High valuable licorice for livestock feeding irrigated with saline water, Central Kyzylkum , Uzbekistan

Rural Communities become familiar with new salt tolerant dual-purpose crops

Thematic Area: Crop Productivity and Diversification

Purpose: Increase agricultural productivity of marginal lands through diversification of agro-biodiversity, or cultivation of alternative salt-and drought-tolerant crops

Geographic Scope: Uzbekistan, Kazakhstan, and Tajikistan (Central Asia)

Timeline: 2012-2014

Partners:
International Crops Research Institute for the Semi Arid –Tropics (ICRISAT)
International Center for Research in Dry Areas (ICARDA)

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Due to freshwater scarcity, countries located in the Aral Sea and Caspian Sea Basins are struggling to grow enough food and animal feed to meet the need of a fast growing population. The situation is further exacerbated due to the magnitude of land degradation and salinity, coupled with inappropriate cropping patterns especially the monocropping of wheat and cotton, overgrazing, and inadequate on-farm management practices. This has led to the loss of biodiversity, soil fertility and organic matter.

Cumulative losses/costs associated with desertification and land degradation in the Central Asia (CA) region - Turkmenistan, Tajikistan, Uzbekistan and Kazakhstan - has been estimated at $2.5 billion. There is a dire need to identify alternative agricultural production systems that can assist in utilizing the available marginal resources in the region, including low quality water for irrigation in a manner that yields economic returns to the local farmers and agro-pastoralists, while protecting the environment.

In such salt-affected and degraded areas, crop diversification via introduction and integration of sustainable land practices can help boost agricultural productivity and improve the income of farmers in remote rural areas. With proper screening and evaluation, non-conventional salt tolerant crops such as pearl millet *(Pennisetum glaucum)* and sorghum *(Sorghum bicolor)* can become an integral component in local crop-livestock feeding and farming production systems where water and/or soil salinity occurs.

To help CA countries address the problem they are facing, the International Center for Biosaline Agriculture (ICBA) collaborated with the International Crops Research Institute for the Semi Arid –Tropics (ICRISAT) and International Center for Research in Dry Areas (ICARDA) focus on crop diversification and sustainable management of marginal land resources in Uzbekistan, Kazakhstan and Tajikistan.

Activities and Outcomes

The Agriculture for Marginal Lands in CA project addressed the problem of sustainable fodder security by introducing highly productive, tolerant and nutritionally valuable crop varieties along with well-established technologies that are promising for the region. All project activities where community-oriented with the implementation and pilots carried out in a participatory manner.

The first activity aimed to find the most productive and adaptive varieties for nutrient–poor and salt-affected environments in CA.

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Salt-affected and degraded area in Uzbekistan which will benefit from crop diversification and proper management.

This involved testing more than 53 varieties of sorghum and 11 varieties of pearl millet in various agro-ecological zones in each of the three countries.

Research was conducted to evaluate superior genotypes, together with cultivation of improved salt and drought lines of sorghum and pearl millet. On-station plus on-farm trials with full farmer participation were established on various marginal lands. This included trials in the agropastoral sandy desert ecosystems of Central Kyzylkum (Uzbekistan) where hydrothermal saline water was used for irrigation.

Productive farmer-acceptable, high-yielding dual purpose sorghum and pear millet genotypes varieties resistant to abiotic stress were identified and adapted to different soil salinity diversity in each country through participatory work with local farmers. Pilot trials for these varieties were carried in Bayavut district and Syrdarya region. Farms were equipped with moisture, temperatures, salinity and ground water sensors. The sensors allowed year round measurement to control root-zone soil salinity and ground water mineralization and fluctuation allowing for irrigation regime management during vegetation season. Both crops demonstrated high water consumption efficiency and high tolerance to drought, heat and soil salinity.

Results clearly showed that pearl millet could become an economically interesting alternative crop in marginal salt-affected lands in CA that would reduce summer fallow practices by increasing the land use ration, improving biodiversity and generating alternative flexible options to improve livelihoods of poor farmers. Subsequently, new promising local varieties resistant to both biotic and abiotic stresses were developed from ICBA-ICRISAT breeding material and released in late 2014, early 2015. This included pearl millet "Hashaki 1" and “Tamuz”, and sorghum “Keshen” varieties as all proved to be successful and ready for wide scale adoption.

Lack of sufficient seeds to meet the farmer demands is regularly the main obstacle to wider adoption of better adapted crop species and genotypes. Hence, the project worked on increasing the availability of the amount of seeds of the selected genotypes of dual-purpose crops suitable for marginal and stressed environments. Nonetheless, uptake of these new varieties is a continuous challenge especially as ensuring constant seed provision in some of the countries where seeds are provided by state-run institutions may be difficult.

Future Directions

Future ICBA activities will aim to initiate large scale adoption of the released varieties of pearl millet and sorghum through seed multiplication and working with farmers and extension agents to disseminate and build their capacity on the best management practices to attain optimum adoption results. Efforts to increase seed provision through working with seed providers is another critical aspect. Appropriate outreach and communication material in local dialects need to be developed.

Additionally, small-sized nurseries of selected dual-purpose and forage type populations of sorghum and pearl millet need to be assessed for at least two years before being ready for wider scale adoption by farmers. ICBA will also pursue beginning hybridization programs that use high-yielding and salinity-tolerant germplasm to develop varieties with greater yield potential and salinity tolerance.

Salt-tolerant forages, pearl millet and sorghum, provide hope for the livelihood of local farmers in Uzbekistan.