Brief Report

CRP Dryland Systems

Activity Cluster: (CA) 4.2.: *Improving the productive use of marginal lands in mixed farming and pastoral systems*

The main goal of this activity is identifying and implementing alternative land use options for a sustainable management of the marginal land resources in three countries (Uzbekistan, Kazakhstan and Turkmenistan) for improving land productivity and livelihood of farmers and agropastoral communities and providing eco-systems services

Action Site: Aral Sea

Region : Ylyas Farm, Karabuga village, Karauzyak district, Karakalpakstan

Sub-activity: "Crops Diversification in mixed farming and in rice fallows on marginal lands in Karakalpakstan"

Year: 2014

Reporting Center: International Center for Biosaline Agriculture (ICBA) & AVRDC (The World Vegetable Center)

Outputs:
Farmer-participatory evaluation and scaling up of farmer-acceptable and high-yielding varieties/improved lines of salt tolerant crops and domesticated halophytes with rapid accumulation of green biomass and achievable sugar, protein, oil content, stover and seed yields at Ylyas dekhkan farm , Karabuga village, Karauzyak district

Planting of drought and salt tolerant sorghum (3 varieties); pearl millet (2), sesame (1), fodder beet (1) ; maize (2) forage and vegetable legumes (6), topinambur (2) and kenaf (1) in mixed farming at rice fallows and/or in cotton field margins (salt affected, abandoned lands) on the area of 0,006 ha each

Developing of management practices (crop, soil and irrigation) for the promising drought and salt tolerant high yield crops in mixed farming system to optimize crops diversification and productivity under marginal and saline conditions.

Conducting field seminar for young farmers and women-group at Karabuga village on technology of cultivation and seed production of selected new valuable crops for their quick adoption of at householder lands

Agricultural sustainability and food security inarid and semi-arid areas of the Aral Sea Basin arelimited by the salinizationof arable land, and by water availability. The biological potential of some agricultural crops to withstand the salinization and water deficit may become a key component of farming systems.Several crops were selected for this study to investigate their performance under saline water and soil conditions in the KarakalpakistanRepublic. Growth performance and yield

productivity were analyzed in the downstream arid zone of the Aral Sea Basinat two soil salinity levels,calculated as total dissolved salts (TDS): low saline (< 0.9 g/l), and medium saline (> 1.5 g/l).

Ground water salinity variedbetween3g/l and 9g/l from spring to summer, and irrigation water salinity varied between1.6g/l and 3.1g/l,with sulphate as the predominant anion and sodium as the predominant cations in both ground and irrigation water.

The results showed insignificant differences between crop varieties in seed germination rate, plant height, and accumulation of green biomass, when cultivated on soils with light clay texture and low level of soil salinity (Table 1). A sharp decrease (by about 2.6 times) in plant density and survival rate is seen for maize grown on medium saline soil with heavy texture

Table1. **Agrobiological characteristics and yield of green forage and grain production for**

Variety/Improved lines	Field seed germination rate (%)	Height of plant (cm)	Period of vegetation (days)	Yield of green forage (t/ha-1)	Grain yield (t/ha-1)
Pearl millet					
Hashaki1	90±1.3	182.5±1.5	81.5	34.9±5.8	2,0
HHVBCTall	79±1.8		90,4	42.0±6.4	1,8
Sorghum					
SPV 1141	74±2.0	280±2.0	96-110	97.0±4.9	5,3
ISCV 93046	69±2.8	226±2.1	95-125	93.0±5.2	3,2
Uzbekistan 18	77±4.2	288±3.1	120-135	101,0±6.3	4,8
Vakhsh (multi-cutting)	75±3.4	195±2.0	115-135	82.0±4.8	3,8
Boy Dzhugara	90±5.0	258±1.9	120-135	113.0±5.2	5,8
Korabosh	62±4.3	181.0±6.0	80-110	58.0±6.0	4,0
Maize					
Uzbekiston 601 ECB	78±1.2	217.0±7.1	106.0±3.1	35.3±0.7	8,0
Karasuv350 AMB (early maturity after winter wheat)	69±31.6	199.5±9.5	94.0±2.5	30.2±0.2	6,0
Fodder beet (biannual plant)	67±4.9	76,4±6.3	After 80 days	Foliage fro animals	6.48 t/ha tuber production
Legumes					
Mung bean Durdona var	89-92	44-47	96-101	4,8 (foliage +pods	2.1
Mung bean Marjon	87-90	92-106	162-170	5,2(foliage +pods)	2.4
Soybean Uzbek 6 var.	65	68.6-72.0	126-135	9.0 ((foliage +pods)	No mature seeds
Yard long bean (Oltin soch)	58	63-65	80-96	3.2 (foliage +pods)	1.1-1.6
Cow pea (prostrate improved line)	84,0	48,0-54,9	96-112	4.0(foliage +pods)	0.9-1.2
Technical crops					
Sesame (Sesamum orientale (local var.)	90	155-185 cm	96-120	22.3-26.8	0.5-1.0
Kenaf (Hibiscus cannabinus)	96	385,4-412.0	130-140	18.3-20.6	-
Sunflower (Helianthus	88	112-146	120-160	24.4-28.2	1.6-2.0

annuus) Karlik var.					
Topinambur (H. tuberosus) Mujaza var.	82	180-196	145-170	32.6-40.3	-
Topinambur Fayaz Baraka var.	91	210-290cm	140-155	35, 6-42.0 (including tiuber)	-

Chemical composition of vegetable soybean green seeds (Uzbekistan)

Variety	Dry matter,%	Common sugar,%	Cellulose, %	Fat,%	Starch,%	Protein, %	Nitrates, mg/kg
Sulton	16.7	6.8	3.0	20.8	2.3	42.5	91
Universal	15.2	5.4	3.2	20.6	2.1	44.4	90
Ilkhom	14.9	5.0	3.4	20.7	2.2	43.9	92

Chemical composition of vegetable mung bean green seeds (Uzbekistan)

Variety	Common sugar,%	Fat,%	Starch,%	Protein, %	Cellulose, %	Nitrates, mg/kg
Kakhrabo	4,2	0,98	2,0	18,7	4,1	88
Durdona	4,0	1,90	1,8	18,8	5,9	80
Turron	4,8	0,96	1,9	18,9	4,0	84

Outcomes:

Salt affected margins taken under cultivation of low inputs salt tolerant crops

Crops design (Ylias farmer in the center) Karabuga, Karakalpakstan

Experimental trials during plants establishment (seed germination –a most sensitive stage)

The same trials after 3 months

Drs Zulfia Sultaniva and Ganiboy Khodjabergenov responsable for filed data monitoring

Sorghum ISCV 93046 ICBA improved line (for seeds) under fish net against birds

Sorghum (ICBA improved salt tolerant lines) mixed with legumes

Sesame (Sesamum orientale) short –produced for oil seeds

Kenaf ((Hibiscus cannabinus) – fast growing salt and drought tolerant (at the abandoned cotton filed margins)

Mung bean Durdona variety , AVRDC germplasm

Mung bean Marjon variety (local adapted)

Yard long bean (Oltin Soch variety) –AVRDC germplasm

Cow pea (ICBA improved line) salt tolerant (covering vegetable legume)

Outcomes:

1. Average threshold salinity level for examined crops ranged from 1,7-8.5 dS/m^{-1} ; the most sensitive to soils salinity in the field were shown for corn, some of legumes followed by sunflower, sesame, sorghum, fodder beet. Sorghum improved lines ISCV 93046, SPV 1441 , pearl millet, kenaf , artichoke , improved lines of caw pea showed a significant increasing in green and dry biomass .

2. Seed germination and early stages of green biomass accumulation are the most sensitive to soils salinity for all investigated crops

3. 18 low –input dual-purpose crops (sorghum, pearl millet, vegetable legumes, early maturity drought tolerant corn, fodder beet, vegetable legumes, sesame, kenaf and artichoke) were identified for the reclamation of salt affected lands at Karabuga farm

4. Majority of early maturity sorghum, pearl millet and legumes are salt tolerant and drought tolerant (with high water use efficiency capacity). Being cultivated on saline soils with shallow water table requires only two limited irrigation during vegetation season

Partners:

Karakalpakstan Branch of Tashkent Agrarian University, Nukus, Karakalpakstan
Nukus Experimental Forestry Station, Republic Scientific and Production Center of Decorative Horticulture and Forestry
Karakalpakstan Branch of Rice Institute
Uzbek Institute of Karakul Sheep Breeding and Desert Ecology