Strengthening Biosaline Agriculture Research and Development for rehabilitation of salt-affected lands in Central Asia and Caucasus

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Annual Steering Committee Meeting, September 4-6, 2012 Issyk-Kul, Kyrgyzstan

Work & Research of ICBA IN CA region (2011-2012):

- Demonstrate the value of saline water and lands *(marginal)* resources for the different production systems
- To cultivate ***environmentally and economically*** useful plants for region
- Transfer the results to national research services and communities
- Capacity building of national manpower

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Projects	Country	Partners	Main Objective
Sorghum and Pearl Millet for Crop Diversification, Improved Crop-Livestock Productivity and Farmers Livelihood in Central Asia	Uzbekistan, Tajikistan, Kazakhstan	Institute of Karakul Sheep Breeding and Desert Ecology research; Uzbek Corn Station; Gulistan State University; Karakalpakstan Branch of Institute of Rise Production; Tajik Academy of Agricultural Research Kyzylorda Institute of Rice Production	Develop crop management technologies for economic and sustainable livestock production systems
Improving Livelihoods of Rural Communities under Saline Desert Environments in Turkmenistan	Turkmenistan	National Institute of Flora and Fauna Ministry of Nature Protection of Turkmenistan	Integrated agri-silvi-pastoral systems to adapt the climate change and improve farmers' income in the desert areas in Turkmenistan
Web-based platforms of water quality of Zarafshan River basin integrated with promotion of biosaline technologies for utilization of marginal resources as part of a climate change adaptation strategy	Uzbekistan	Samarqand State University; Karakul Sheep Breeding Institute; Yamanashi University (Japan)	Develop data mining and managing system for collected dataset. Provide integrated data to the interested communities.
Utilization of low quality water for halophytic forage and renewable energy production	Uzbekistan	Nevada University (USA); Krass; National University of Uzbekistan; Academy of Sciences of Uzbekistan	Appropriate technologies of cultivation of halophytes in single or mixed in Uzbekistan; to produce sufficient amount of plant biomass for biogas production ; desalination and improvement of lands

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Islamic Development Bank
Together We Build A Better Future

ICARDA

ICRISAT
Science with a human face

Ongoing Project: Sorghum and Pearl Millet for Crop Diversification, Improved Crop-Livestock Productivity and Farmers Livelihood in Central Asia (2011-2014).

Main Goal

- to disseminate high-yielding, salinity-tolerant sorghum and pearl millet lines in salinity-affected and marginal environments (CA)
- to develop crop management technologies for economic and sustainable livestock production systems

NARS countries: ***Uzbekistan*** (3 sites); ***Kazakhstan*** (3 sites); ***Karakalpakstan*** (2 sites); ***Tajikistan*** (2 sites)

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Findings:

- International collection nursery were established: more than 78 **improved lines** and varieties along with local collection
- Pearl millet Sudan Pop III, Guerinian-4, Raj 171, IP 6107, 6112, 19586, 22269, HHVBC Tall, ICMV 7704, MC94C2;
- Sorghum ICSV 93046, ICSSH 58, SPV 1411, ICSR 93034, ICSV 25280, S 35, Sugar Graze
- **30%** higher dry fodder and **25%** consistently higher yield with superior quality and disease resistance over the local checks

Lead to Success in local Breeding Program

"

HASHAKI 1" selected from Self-pollinated population line HHVBC Tall from ICRISAT was recognized promising by SVTC in Uzbekistan.

Outputs

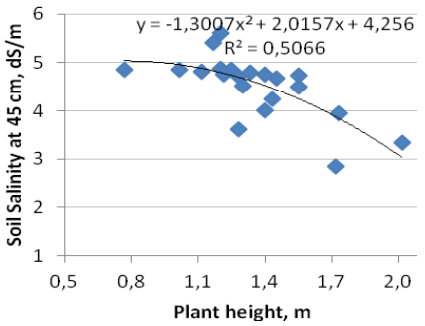
•sorghum cultivar early maturing (**64-72 days**):

•green biomass – **38.0 - 45.0 t/ha**;

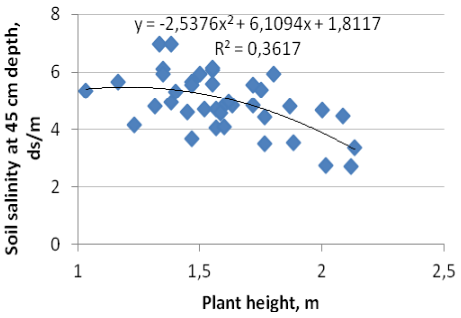
•grain yield- **3.0t/ha.**

New local variety is resistant to moderate soil salinity and low quality water with grain yield 2.96 t/ha.

Trend of salt tolerance



Sorghum germplasm



Pearl millet varieties

The salt sensitive variety as per lowest plant density (467 plants/ha) was observed for ***Raj 171***

Nutritional value of forage and grain of selected populations and varieties for livestock feeding

Investigated varieties/improved lines	Crude cellulose (%)	Crude protein (%)	Carbohydrates (%)	Fat (%)	Carotene (mg/kg)	Ash (%)
S 35	24,3	19,5	5,4	1,7	19,1	7,8
ICSV 25280	23,8	18,7	6,8	1,4	18,5	7,3
ICSV 25275	23,7	21,5	5,3	1,9	22,1	7,8
ICSV 112	23,4	21,5	5,9	2,1	20,5	7,3
SPV 1411	25,9	22,3	6,8	1,9	20,6	8,8
ICSSH 28	27,1	25,2	9,4	2,2	16,9	9
ICSV 93046	21,3	19,9	6,7	2,3	21,5	5,9
ICSR 93034	24,1	18,6	6,9	2,7	20,8	6,9
ICSV 25274	21,2	18,7	7,2	2,4	22,5	6,8
ICSSH 58	28,4	22,4	10,4	2,6	17,8	9,1
ICSV 745	20,8	18,8	7,9	2,1	23,4	7,5
Control	23,1	19,8	7,8	2	18	6,6

* Nutritional value of forage (calculated as per DM) of different *sorghum varieties* at the flowering stage at Kyzylorda Farm, Kazakhstan (Average for 2011-2012)

Seed Multiplication Trials (on-farm level)

Sites trial of about 0.3 ha organized in:

- Kyzylkesek and Zangyota sites in Uzbekistan;
- Abay farm southern Kazahstan;
- Gafurov Farm in Tajikistan.

SM & PM showing best results were used

Recovery: Seeds can be specially produced by separate or cluster farmers of nearby villages on a remunerative price to recover the cost of seed production, plus 30-50% profit.

28 farmer were identified and invited to form a network in Tajikistan.

Social networks will be created in Uzbekistan and Kazakhstan.

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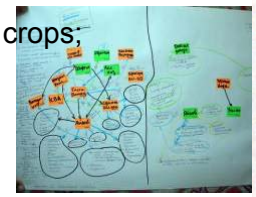
Socio-Economic Assessment

Alternative more profitable livelihoods strategies creation were suggested after interviews and analyzing to:

−stable arid fodder production basis;
−cultivation of high yield;
−salt, drought and heat tolerant crops;



Pearl millet **a high nutritive-value** forage crop, popular among farmers:

- **High biomass;**
- **Tillering ability;**
- **High digestibility;**
- **Low lignin;**
- **High metabolizable energy;**
- **High crude protein.**

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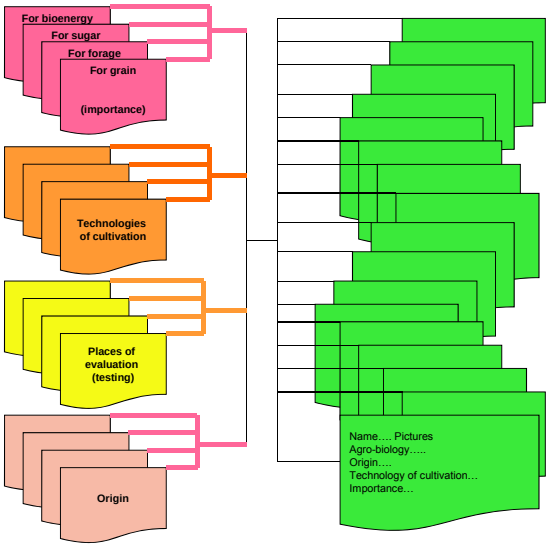
DATABASE for SM & PM (for Central Asian region)

- A. Data collection on green biomass and grain yield from trial (2012)
- B. Data collection from earlier trial (2006-2011)
- C. Available Data on sorghum and pearl millet (before 2006)



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Institute of Desert, Flora and Fauna (IDFF)
Ministry of Nature Protection of Turkmenistan

Ongoing Project: *"Improving Livelihoods of Rural Communities under Saline Desert Environments in Turkmenistan"*

(Development of sustainable water, rangelands and livestock management) 2010-2012

Main Goal

- *Improving productivity of marginal lands using low quality water resources for irrigation;*
- *Developing integrated agri-silvi-pastoral systems to adapt the climate change and improve farmers' income in the desert areas in Turkmenistan*

Target area: ***Dashauz*** (northern); ***Ashgabat*** (southern); *salt affected & degraded rangelands of Karakum Desert Turkmenistan*

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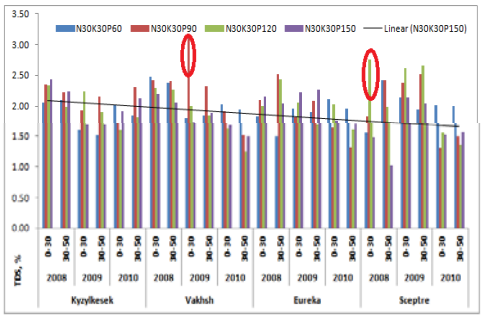
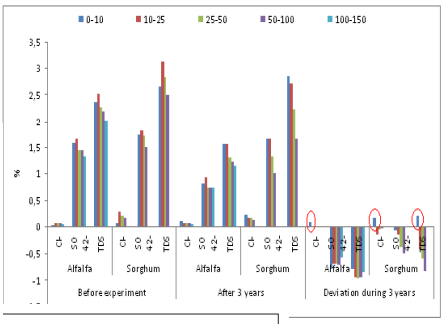
Reclamation of Takyrs Saline Soil (Karakum Desert, near Ashgabat, November 2010)

Seedlings production of *Haloxylon* and *Pistachio vera* in the field;

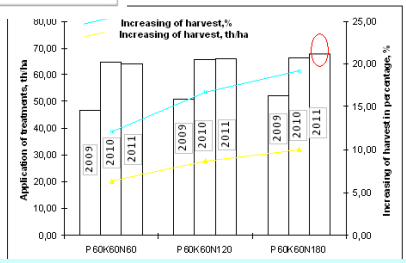
Irrigation with ground mineralized water – as single source of water available in the Karakum sandy desert

Soil and Water Salinity Management on waste irrigated lands at Akdepe site (during a period of 3 years)





Desalinization effect and yield productivity increase under alfalfa, pearl millet and less under sorghum



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International Centre for Biosaline Agriculture (ICBA)

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University of Nevada (USA)

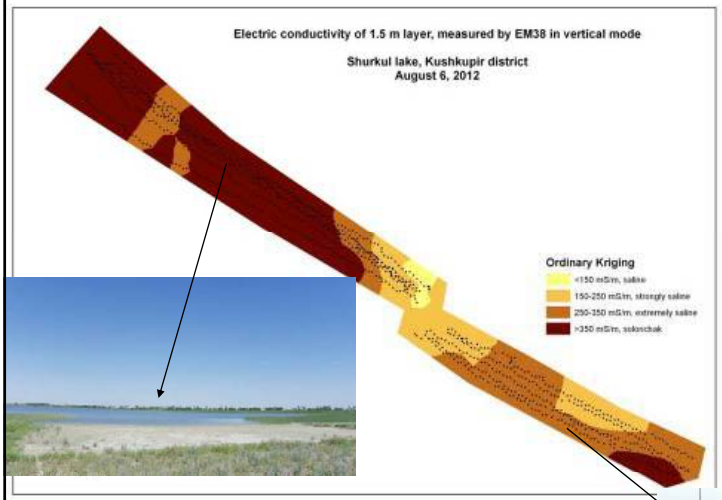
New Project: *"Utilization of low quality water for halophytic forage and renewable energy production"*
2012-2014

Funded by USAID

Main Goal:

- *Appropriate technologies of cultivation of halophytes in single or mixed in Uzbekistan*
- *to produce sufficient amount of plant biomass for biogas production*
- *desalination and improvement of lands*

Target area: ***Aral Sea Basin*** (Khoresm region and Karakata Saline Depression), Central Kyzylkum Uzbekistan



Utilization of Koshkupur mineralized lake water and thermal water (Kyzylkum) for establishment of halophytic industrial plantation/pasture to ensure ecosystem function stability; pasture ecosystem services and diversify income for rural communities in Aral Sea Basin and Kyzylkum desert

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Total mineral content

Halophytes contain very high concentrations of mineral compounds: 40-50% of DM

Plant species	Water content %	DM, % Dry matter content	Total mineral content, % from fresh weight	Total mineral content, % from dry weight
Kalidium caspicum	76,96	23,04	9,47	42.84 ± 2.48
Climacoptera lanata	78,52	21,48	10,09	51.62 ± 6.6
Salicornia europaea	83,02	16,98	6,75	38,64 ± 1.64
Panicum coloratum	-	-	-	5.01 + 0.15
			Ash, % on FM[1] basis	Ash, % on DM[2] basis

[1] FM – fresh matter
[2] DM – dry matter

Summary

- **Salinity in CAC** is mainly related to drainage and on-farm management of water table
- **Incentives for farmers and agro-pastoralists** to invest in increasing productivity of marginal lands and to establish small alliance (cooperatives) and investments in market outlets are very important
- **Creating institutional arrangements and policy interventions** to increase community participation in arid biosaline conservation agriculture on marginal lands is critical.

ICBA FUTURE PROSPECTS

1. Linkages (CRPs) and activities in CA region
CRP1- Developing technology, policy, and institutional innovations to improve livelihoods for highly vulnerable populations

CRP5- Durable solutions for water scarcity and land degradation

CRP6- Agroforestry

2. Strengthening International & National Research and Partnerships (NIFA, GIZ, EU,,Russian Initiative; countries National Programs

3. CAPACITY BUILDING & KNOWLEDGE SHARING

Thank you for attention!

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