Abridged Summary of SLMR Results and Works-plans

(July –Dec 2008)

Land degradation represents diminished ability of ecosystems or landscapes to support and sustain livelihoods functions and services attributed to these ecosystems. Land degradation takes many forms. Areas with greatest potential for land and water degradation are those with highly weathered soils, steep slopes, areas denuded of vegetation, inadequate or excess rainfall, and high temperatures. Land degradation results in declining total factor productivity of inputs such as to increase production costs. It adversely affects the livelihoods of farmers. The main cause of land degradation is inappropriate use of agricultural lands. Land degradation is driven by a complex interplay of bio-physico-chemical, socio-political and techno-economic factors. Policy and livelihood decisions that fail to take into account longer-term consequences on resource quality often result in land degradation. In order to tackle land degradation problems, different NRM technology options appropriate to site specific situations were field validated at 10 locations in the five Central Asian countries.

The SLMR activities can be broadly grouped into namely, (i) the Regional activities of ICARDA- SLMR (GIS and Socio-economic& policy research), and (ii) the National program research activities. Salient research outputs have been listed here by countries

A. Regional activities of ICARDA- SLMR (GIS and SEP Research):

Salient accomplishments:

- Based on the UNESCO classification of dry zones, Central Asia is covered by twenty-one (21) agro-climatic zones. Sparsely vegetated deserts and grass-/shrub zones occupy 68 per cent of the total geographical area and rest by 10 zones. Agro-ecologically there are 187 zones in Central Asia (CA).

- SLMR research sites (10) in five countries represent only one-fourth (24%) of CA.

- Conversion from virgin land to cultivation led to soil carbon losses from 9 to 21 percent. In Central Asia, total CO_2 emissions combined, amounts to 55 million tons per year.

- Socio-economic survey templates pre-tested and sample size for survey determined for each SLMR site.

- *In-season Yield* (INSEY) for winter wheat can be estimated at 140 days after sowing with Optical sensor based 'GreenSeeker' technology. N use efficiency can be improved by 12-20% in Central Asia .

- 131 scientists, technicians, tractor operators and farmers have been trained on planting and laser assisted land leveling implements, Salinity probes, Soil moisture probes and Optical sensors and conduct of livelihood surveys.

B. National research program activities:

Salient accomplishment: Kazakhstan

- Soil surveys in Kaptagai indicated that 84 % soils in Kyzylorda suffers from salinity problems .
- Landuse conversion of virgin soils for crop production has led to loss in soil organic carbon by 50% (SOC content now just 2%).
- Most of the soils are N hungry. Rationale use of P and K fertilizer in cropping system can save large amounts of fertilizers.
- Appropriate water management in rice can 15% irrigation water (nearly 60-70cm column of water /ha). Urgent need for breeding good rice cultivars.
- *Echinochloa, Bolboschoenus* and *Phragmites communis* predominant weeds of rice culture which can be controlled by 'Pendimethylene', and 'Gullivar' when used at appropriate times.
- *Direct dry seeded rice on raised beds save water, prevent crop lodging and improve crop yields with growth promoters* MERS and Hymat sodium
- Normal fodder life line for the livestock in Janatas deserts is *Safora, Artemisia diffucia* and *Ceratocarpus erenarius*
- Initial results suggest that new introductions such as *Kochia prostrata, Agropyron fragile, Calligonum caputmedusae, Calligonum eriopodum, Eurotia ceratoides* and *Salsola richteri can* prove useful for this region

Research Issues being Tackled- Kazakhstan

- Enhancing productivity of the desertic lands: fodder availability, overgrazing
- Improve water productivity and management of saline environments in down-stream areas
- Develop direct seeded rice technology for water saving and improve yields

Salient accomplishment : Kyrgyzstan

- Inter and intra-specie genotypic variations in winter wheat can be harnessed to breed cultivars for new RCT platforms (surface seeding, zero-till and raised bed planting systems) to crop yields
- Zero till advances the sowing of winter wheat by 10 days. Until seed is covered by residues , by water or planking serious bird damages is inevitable.
- Fertilizer doses of N in wheat can be reduced to 120kg N/ ha in many parts of the Chu Valley.
- Saline drainage water (EC 1-3dS/m) can be used to meet crop water demands in later growth stages of most crops.
- With identification of herbicides (Stomp @ 5 L/ha ; and Dialen @ 1 L/ha) weeds in maize fields can be controlled to expand its acreage.
- Farmers have adopted bed planting of maize and other crops using the multicrop raised bed / zerotill planter.
- Controlled-irrigation in sloping lands using plastic portable chutes saves water, improve water application and minimize irrigation-induced soil erosion.

Research Issues being Tackled- Kyrgyzstan

- Enhancing productivity of the desertic lands: fodder availability, overgrazing
- Improve water productivity and management of saline environments in down-stream areas
- Develop direct seeded rice technology for water saving and improve yields

Salient accomplishment: Tajikistan (Based on site visit)

- Inward-sloping terraces with mulch help catch snow melts to significantly improve grape production.
- Vegetative gully plugs combined with mechanical check bunds very helpful in control of soil erosion by water.
- Inter-cultivation of beans, red beets with summer maize on 60 cm raised beds can significantly improve the total system productivity.
- Alternate furrow irrigation can save 30-40 cm water in cotton planted on the 90cm wide raised beds. Under saline situations, Transplanting of cotton seedlings very useful to avoid late planting and reduce seedling mortality.

Research Issues being Tackled- Tajikistan

- Enhancing productivity of the sloping lands
- Gully plugs
- Managing saline environment in Cotton-wheat systems

Salient accomplishment: Turkmenistan

- The optimal window for planting winter wheat was observed as from October 6-22 Other planting times reduced wheat yields upto 2.5 tons /ha.
- New RCTs (zerotillage and bed planting) can reduce production costs of winter wheat by nearly 23 percent and promote water saving and reduce erosion hazards.
- Soil erosion on sloping lands can be reduced by maximizing the surface cover with extra-short duration pigeonpea.
- Tree species are being tested for their relative efficacy in control wind erosion and prevent crop losses

Research Issues being Tackled- Turkmenistan

- Assessment of crop losses in cotton-wheat systems due to salinity
- Shelter-belts/ wind breaks for control of soil erosions
- N management

Salient accomplishment: Uzbekistan

- Low initial soil salinity , slow salinization rates and high final soil salinity permit was found as the best strategy for use of saline drainage water in crop production
- Saline irrigation followed by fresh water saves canal supplies and improve leaching efficiency and similar crop yields.
- Raised bed planting of winter wheat, improved yield (up to 14%) and water productivity (6-7%) and net income by 10-12 percent.
- Changes in planting geometry, opens new opportunities for diversification of cotton-wheat systems in Central Asia and hence improved livelihoods.
- Initial results suggest that Apricot *[Armeniaca vulgaris*- 103cm*];* Ailanto*[Ailanthus aitissima- 23 cm];* Poplar *[Populus puramidalis- 40cm]and* Peach *[Persica vulgaris- 15cm] may prove* promising in the Kyzylkum desert.
- Fodder availability for livestock can be substantially improved by growing Pearl millet cultivar (Aip 13150). *Kochia scoparia,* highly tolerant to drought and salt stresses.

Research Issues being Tackled- Uzbekistan

- Enhancing productivity of the desertic lands: fodder availability, overgrazing
- Improve water productivity and management of saline environments
- Enhance intensification and diversification of Cotton –wheat systems.

Abridged Work Plans- SLMR activities (July –Dec 2008)

A. ICARDA Components

GIS Components	Qr3, 2008	Qr4, 2008	Expected results	Outcomes
1. Library searches for soil, climate and geological data bases	**X**	**X**	• Data enrichment	
2. Soil map compilation for CA and transformation into GIS layer format .	**X**	**X**	• Maps based on enriched data base	
3.Digitization and integration of CACILM site GIS projects	**X**	**X**	• CD is available	
4. Interpretations and synthesis		**X**	• Reports	• Mainstreaming of SLMR results into respective national program frameworks
Socio economic and policy research				
5. Full scale livelihood surveys launched in all SLMR sites	**X**	**X**	Impact of land degradation on rural livelihoods and farmers' coping strategies against land degradation evaluated	• Mainstreaming SLMR options for improved livelihoods and reduced land degradation
6. Ex-ante analysis of the SLMR technologies		**X**	• Report	

Kazakhstan	Qr3 2008	Qr4 2008	Expected Results	Outcomes
1. Evaluate the current status of land degradation in irrigated lands of "Kaptagay" LLC in Shielli massif of Kazakhstan.	X	X	• Identification of critical areas for soil salinity and water table depth (maps scale 1:25000) for land use planning • Recommendations on soil amelioration	• Farmer associations use the land use maps for land development
2. Assessment of the existing soil organic carbon status and potential for carbon sequestration in irrigated lands of "Kaptagay" LLC in Shielli massif of Kazakhstan.	X	X	• Soil fertility maps for rationale use of (NPK) fertilizer nutrients in rice based cropping systems. • Carbon sequestration potential as a result of applied SLM-R techniques	• Farmer associations adopt rationale fertilizer practices in rice systems
3. Studies on the effect of irrigation schedules on rice yield, saving in irrigation water and salinity of the ponded waters and soil profile.	X	X	• Increasing productivity of direct dry seeded rice crops • Saving in irrigation water and drainage volumes for disposal • Economic analysis of production costs	• Direct dry seeded rice technology on wide raised beds is adopted by the farmers
4.Study the effect of different border dimensions on salt- water-salt balances in rice culture for saving in irrigation water and salt buildup.	X	X	• Seasonal dynamics of salts in rice systems to effect savings in irrigation water • Analysis of the economic effectiveness	• WUA change water allocations
5. Evaluate the performance of new rice cultivars developed in Kazakhstan and Russian Federation	X	X	• New Rice cultivars identified for higher yields and tolerance to stresses • Analysis of the economic effectiveness	• New rice cultivars become available to increase biodiversity
6. Calibration and use of Optical crop canopy sensors (GreenSeekers) for efficient nitrogen management	X	X	• Development of a N calculator for farm advisory services and in-season yield predictions Winter wheat would be planted in 2008	• N Algorithms used in farmer advisory in due course
7. Evaluate the performance of different trees, shrubs, grasses, fodder and cereal dual purpose crops in submontane plains, sand massifs, and sands in Abylai area.	X	X	• Identification of fodder species for biotic and abiotic stresses for the livestock • Improving the surface cover to reduce the wind erosion	• Dual purpose cereal crops help reduce fodder • Shortages and prevent overgrazing.
8.Dissemination of results and developing mechanisms for up scaling and scaling out the SLMR options	X	X	• Organizing seminars / traveling seminars, Farmer field days and Radio/ TV talks to promote adoption of SLM-R M practices .	• Better understanding of land degradation and technical options

Kyrgyzstan	Qr3	Qr4	Expected Results	Outcomes
1. Evaluation of performance of new cultivars (wheat / Barley) suited to different tillage systems for improved water productivity in shallow water table conditions.	**X**		• Identification winter wheat cultivars for raised bed planting by: • Continue zero till winter wheat yield potential is not high (1.85 t/ha).	Farmers adopt new wheat cultivars if the seed systems in place
		X	• Test the two elite varieties of winter wheat • The analysis of agro-techniques of maize cultivation (spring and summer crops) with the use of raised bed planter will be conducted.	Agro-techniques for maize production is used in raised bed planting system with new herbicide molecules
2. Study the effect of different herbicide molecules (pre-and post-emergence) on weeds dynamics, water productivity for increased farm incomes.	**X**	**X**	• Weed management in spring and summer maize crops with the use of different pre- and post-emergence herbicides	Identification of herbicide molecules facilitates more area coverage under maize
3. Studies on the effect of controlled irrigation methods in improving crop -water productivity, and reduce irrigation-induced soil erosion.	**X**	**X**	• Effectiveness of the plastic portable chutes in maize grown on sloping lands . • Role of intercrops and analysis of the water saving, salinity on leveled field.	Plastic chutes become available locally for reduce soil erosion
4. Effect of the conjunctive use of fresh and drainage water on crop yields and soil quality (salinity build-up).	**X**	**X**	• Results on conjunctive use of saline and fresh water become available to meet crop water demands	
5. Evaluate the impact of laser-assisted precision land leveling on water savings, salinity and crop yields in irrigated agro-ecologies.	**X**		• Role of land leveling on yield and water use	
6. Calibration and use of Optical crop canopy sensors (Green Seekers) for measuring crop development, comparing crop management practices for SLM and efficient nitrogen management.	**X**		• N Calibration curve is developed with winter wheat crops	Saving of N in winter wheat, better farmer advisory services
7. Dissemination of results and developing mechanisms for up scaling and scaling out the SLMR options	**X**	**X**	• Field days organized on application of laser land leveling and raised bed planter. The event was widely transmitted via mass media including republican television. LL Demons on farmer fields organized	

SLMR Activities: Tajikistan	Qr3 2008	Qr4 2008	Expected Results	Outcomes
1. Effect of Strip cropping on runoff and soil erosion in sloping lands under in agri-horti production system	**X**	**X**	• Winter crops are planted on sloping lands prevent the erosion and surface runoff .	
2. Study the impact of tillage, terrace configurations and snow catching soil moisture conservation and yield of cereal crops and grape fruits, soil erosion in sloping landscapes	**X**	**X**	• Higher productivity of grapes and intercrops and reduced soil erosion	Snow catch practices reduce drought like conditions and improve yields
			•	
3. Rationale use of degraded sloping lands for enhancing productivity in low and high rainfall regions.	**X**	**X**	• Crop suitability according to landscape	Biodiversity is enhanced
4. Evaluate the efficiency of mechanical and vegetative measures in control of gully erosion for rehabilitation of degraded sloping lands	**X**	**X**	• Tree species and grasses identified to facilitate gully pugs (phyto-ameliorative measures).	Phyto-ameliorative measures are mainstreamed and promoted by government
5. Calibration and use of Optical crop canopy sensors (Green Seekers) for measuring crop development, comparing crop management practices for SLM and efficient nitrogen management.	**X**	**X**	• Winter wheat crop is planted to develop N Calculator	N algorithms used in farm advisory
6.Promoting communities based nursery raising for plantation in sloping lands.	**X**	**X**	• Tree sapling nurseries are developed and distributed amongst farmers	Farmer associations begin to raise nurseries to enhance availability of the tree / fruit tree saplings
7. Dissemination of results and developing mechanisms for up scaling and scaling out the SLMR options	**X**	**X**	• Booklets, leaflets, digests and recommendations on RCT advanced methods will be prepared and disseminated widely amongst population. Mass media also will be attracted.	Better understanding of the SLM options for reduced land degradation
8. Evaluate the performance of wheat, barley, rapeseed and cotton and Halophytes in saline soils in Vakhsh	**X**	**X**	• Salt tolerance of (wheat, barley, rape seed, cotton and halophytes – winter crops) crops in Vakhsh valley.	New seed systems may emerge
9. Study the impact of land leveling and on salinity and soil moisture patterns and crop performances using EM probe &OS sensors .	**X**	**X**	• Benefits of land leveling in water saving and enhancing productivity.	

SLMR Activities : Turkmenistan	Qr 3	Qr 4	Expected Results	Outcomes
1. Assessment of yield losses due to late planting in cotton-wheat cropping system	X	X	• Optimal planting dates for cotton • Assessment of yield losses in cotton due to late planting	• Farmers practice timely planting to reduce crop losses
2. Assessment of yield losses due to salinity. Determine the salt tolerance of cotton and wheat under prevailing climatic conditions.	X	X	• Assessment of cotton yields under the saline condition. • Salt tolerance of cotton. • Validate optimal planting time of wheat - seeding	• Farmers demand seed of the salt tolerant cotton cultivars to reduce crop losses
3.Farmer participatory trials for validation , fine tuning and development of new RCTs	X	X	• Comparative evaluation of traditional and zerotill planted winter wheat in standing cotton (with and without plant residues)	• Main streaming process for manufacturing of new prototypes is initiated by local entrepreneurs to make available them for farmers use
4. Develop permanent raised bed planting system in cotton –wheat sequence.	X	X	• Comparative evaluation of performance of winter wheat planted on the raised beds 3/4 quarters of the year 2008. •Analysis of the cost of cultivation	• Farmers grow winter wheat at reduced costs and save on water
5. Maintaining favorable salt balance in raised-bed furrow system in cotton-wheat	X	X	• Evaluate the different leaching practices for salinity management under different planting methods • Effect of leaching on cotton productivity , irrigational water saving and tillage costs	• Farmers become aware of the benefits of good leaching practices
6. Impact of pigeon-pea and tree species in development of surface covers to control soil erosion in sloping lands.	X	X	• Growth and development of pigeon pea (PP) •Role of PP in prevent soil erosion on sloping lands. • Data on growth and development of planted forest lines and the condition of one year seedlings in nursery. • Survival and growth of tree saplings planted as wind breaks	• PP and wind break shelter belt practices are adopted by the programs and farmers alike to provide for speedy coverage of the bare sloping lands for reduced erosion.
7. Calibration and use of Optical crop canopy sensors (Green Seekers) for measuring crop development, and efficient N anagement.	X	X	• Develop a N calculator for assessing N requirement of wheat crop • Develop INSEY vs NDVI relationship • Precision land leveling technology assessed for savings in water use and yield gains on farmers fields.	• Farmers are able to optimize N fertilizer applications
8. Evaluate the impact of laser-assisted precision land leveling on water savings, salinity and crop yields in irrigated conditions	X	X		• water user associations provide custom service on laser leveling to the members.
9.Dissemination of results and developing mechanisms for up scaling and scaling out the SLMR options	X	X	• Participation on exhibition, distribution of the selected SLM-R technologies by organizing one traveling seminar. These methods will also be disseminated amongst farmers by organizing farmers days. Two appointments with discussions via national television and radio have been planned.	• Farmers and public at large have a better understanding of the causes of land degradation and various technical options available to them to arrest it.

SLMR Activities in Uzbekistan	Qr3, 2008	Qr4, 2008	Expected results	Outcomes
1. Assessment of soil leaching requirements in irrigated plains to enhance water productivity and reduce drainage volumes (Lysimeter and Field Experiment)	**x**	**x**	• Leaching trials for salinity management in winter wheat using saline water	• Technology in mainstreamed by the NARS partners
2. Maintaining favourable soil salinity balance in permanent raised-bed planted cotton-wheat irrigated systems	**X**	**X**	• Results of the Cotton+ Mungbean and Maize+ Mungbean trials become available in 2 raised bed planting systems	• NARS allow the intensification and diversification of the Cotton /Maize based systems
3) Assessment of both native and non-native tree and grass species for their biomass productivity, salt tolerance and bio-drainage ability to rehabilitate the degraded rangelands in arid agro-ecologies	**X**	**X**	• Promising fruit tree saplings planted (300) • Halophyes are planted for fodder and wind erosion control in saline desertic soils	• Seed of fodder grasses become available for the farmers to practice
4. Evaluation of diversified, salinity-resistant crops for enhancing biomass production for livestock in degraded rangelands	**X**	**X**	• Productivity of Sudan grass + horse beans, atriplex + Sudan grass, climacoptera + Sudan grass, maize + horse beans evaluated • Productivity of 12 different varieties of millet, varieties of alfalfa and sorghum, halophytes, maize &Sudan grass evaluated	• New intercropping systems become popular for enhanced fodder availability and increased livestock productivity
5. Calibration and use of Optical canopy sensors (Green Seekers) for measuring crop development, comparing crop management practices for SLM and efficient nitrogen management.	**X**	**X**	• N calibration curve is developed for winter wheat In Kibray district of Tashkent	• Optical sensor technology for N management become available for farm advisory .
6. Study the impact of precision laser-assisted land leveling on water saving, salt leaching, and crop performance in irrigated agro-ecologies using EM probe and Optical sensors	**X**	**X**	• Laser land leveling technology demonstrated on farmers fields in “Esanboy Ota” , “Khodja Kabud”, “Umid Shodligi”, “Sherzod Samandor Birligi” farms in Jizakh region	• New laser leveled technology become popular for precise land leveling and increased crop productivity
7. Dissemination of results and developing mechanisms for up scaling and scaling out the SLMR options	**X**	**X**	• organize farmer field day in Pakhtakor and Kyzylkum sites • TV /Radio interviews organized •	• Civil society become aware of the new advances in SLMR technologies