



Expert Consultation on Regional Research Needs Assessment in Central Asia and the Caucasus

FROM ISSUES TO ACTIONS



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FOREWORD

Irrigated and rainfed agriculture together with livestock production systems are important components of the economies of Central Asian and the Caucasus (CAC) republics. Mixed crop-livestock production systems have been the mainstay of livelihoods of the rural people since many centuries. Recent changes consequent to the break up of the Soviet Union have a significant impact on agriculture and the people who depend on it. One of the most significant impacts on these changes has been observed on the quality of the natural resource base resulting in widespread degradation of land and water resources. Land degradation processes which vary in their forms and intensity are now posing serious threats to sustainable livelihoods of the people living in the CAC region.

Agricultural research needs assessment is a continuous process in view of the fast changing socio-economic and policy scenarios and emergence of many other stakeholders, not involved earlier. Whereas many agricultural problems are country specific, there are some problems which are common to all the countries in the region (e.g. river water salinity, climate change etc.) and could be best tackled by joint actions of the governments in CAC. Handling scalar issues of the dimensions encompassing the whole region requires funding support from the international community and active technical backstopping from the CG centers and other advanced institutions. Experiences of APAARI, GFAR, FAO and AARINENA will also prove very relevant in any priority setting exercise. I am extremely happy to know that all these organizations are helping us in the Central Asia and the Caucasus with their rich experiences.

In the current agricultural regional research needs assessment (RNA) and prioritization exercise, efforts have been made to involve stakeholders in NARS of all the CAC countries, CG centers, global and regional fora and international organizations active in the region. It is an important step for advancing agricultural research in the region. This event has also demonstrated that the Central Asia and the Caucasus Association of Agricultural Research Institutions (CACAARI) has become a viable forum for coordinating regional agricultural research activities. It has had some farmer participation, which I believe will grow further. This provides the farmers with a forum for articulating their demands for additional need based research.

Using this opportunity, I would like to thank GFAR, ICARDA and Program Facilitation Unit (PFU) of CGIAR Program for CAC, and personally Drs. Mahmoud Solh, Director General, ICARDA, Raj Paroda and Zakir Khalikulov for all the support and facilitation extended in organizing this event. I am also grateful to the NARS leaders and leading scientists, representatives of CG Centers and international organizations for their inputs during the Expert Consultation. I strongly believe that RNA recommendations would serve as a guide-post for the republics to make investments in agricultural research for rural development and also channelize their efforts in the right directions in coming years. I heartily congratulate the PFU-ICARDA-CAC for the timely publication of the RNA recommendations, most appropriately titled as 'From Issues to Actions'.

Finally, I also would like to thank Dr. Surendra Beniwal, Actg. Regional Coordinator of ICARDA-CAC and Head, PFU-CAC and Dr. Raj Gupta, Consultant, ICARDA-CAC, for their inputs in the preparation of this final report of this Expert Consultation. I sincerely wish that the funding support for agricultural research from the national governments and the international community will grow continuously to tackle serious problems facing the sustainable agricultural development and management of natural resources for improved livelihoods of the people in the region.

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EXPERT CONSULTATION ON REGIONAL RESEARCH NEEDS ASSESSMENT IN CENTRAL ASIA AND THE CAUCASUS

Background

1. Prior to independence and emergence of several republics in Central Asia and the Caucasus (Armenia, Azerbaijan and Georgia in the Caucasus, and Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan in Central Asia), economies of these republics were inter-dependent within the largely centrally-managed economic system of the former Soviet Union. In the then Soviet economic system, each of these republics had been specialized in producing a specific agricultural commodity - a component of the larger system, according to prevailing agro-climatic and bio-physical resources. However, emergence of new geo-political situations has led to disruption of earlier trade arrangements and economic linkages for production and distribution of farm products. With the collapse of such arrangements, each republic has been left with the major task of developing their own independent economy, with agriculture playing an important role. Production environments of the farming systems in Central Asia and the Caucasus (CAC) have also undergone major changes in recent times. These changes have led to breakdown of large-sized 'collective farms' into small farm holdings similar to those found in South Asia, requiring a shift in research paradigm towards development of technologies and agricultural machines that are best suited for small farm households and production units.

2. Some of the major changes include conversion of the acreage of cropped lands into virgin lands in 20 million hectares (mha) in northern Kazakhstan; introduction of irrigation in over 4 million hectares in south of Central Asia; conversion of large government farms to small private farms - which made large farm machinery and cropping systems inappropriate, and replacement of alfalfa with winter wheat in Tajikistan, Turkmenistan, and Uzbekistan. Changes of the dimensions, although increased grain production but resulted in adverse consequences on the system ecology and sustainability of agriculture vis-à-vis livelihoods of the rural population. The region has witnessed a rapid decline in livestock productivity over the years. Livestock production has always been a flexible source of income for making timely investments for farm capital growth. Recent reports indicate that farmers practicing mixed crop-livestock farming adopt the new technologies faster due to their flexibility and risk bearing capacity.

3. These changes described above require a shift in research paradigm towards development of technologies and agricultural machines that are best suited for small farm households and production units.

4. It is observed that geo-political situations and relatively weak information and communication base hinder to some extent the agricultural development in the region. Extension systems are inadequate and resource-allocation to agricultural research is highly insufficient. One of the major issues is the long-standing isolation of researchers and civil societies in Central Asia and the Caucasus from the international scientific community. This has caused a technology lag and prevented scientific exchanges and transfer of economically viable and time-tested technologies in the region. The challenge of the CG Centers, international development organization and donor agencies is to advance agricultural research on issues that address food insecurity and poverty through sustainable use of natural resources available in plenty. The regional research needs assessment (RNA) workshop, besides identifying agricultural research needs which are country specific as well common to each one of them, also served the objective of bridging the existing inter-regional disconnect described previously.

5. One commonality of CAC republics is that the sustainable livelihoods for the vast majority of population are rooted in agriculture. Irrigated agriculture practiced on 11.4 mha contributes significantly to food security of the CAC region. Rainfed agriculture covers nearly a geographical area of 20.3 mha. A major portion of the geographical area (250.6 mha) is generally used as pastures for the livestock (Table 1a). Agriculture contributes up to 6-45 % of GDP and employs up to 50% of population in the CAC countries (Table 1b). Thus, agriculture is of paramount importance in the region as a whole. Since independence, all these countries have been pre-occupied with the task of developing their own independent economy for the population they hold, and which is significantly dependent on



Figure 1. Map of CAC region



Figure 2. Rangeland affected by degradation

agriculture in some of the member countries. In spite of the large agricultural potential of the region, agricultural productivity and profitability are low due to the fact that arable land resources have been under serious pressure by over-grazing, extension of cropped area, loss of soil fertility, organic matter and by secondary salinization and waterlogging in irrigation command areas. Crop production is variable between years and generally below those of other regions of the world with similar agro-ecologies. The dynamics of the major crops grown in the region between 1995 and 2005 are given in (Table 2) to show some production and productivity trends in different countries.

Table 1a. Land use (million hectares, mha) in the CAC countries, 2003

CAC Country	Total Land	Permanent Pasture lands	Arable Land		
			Rainfed	Irrigated	Total
Armenia	2.82	0.84	0.214	0.286	0.50
Azerbaijan	8.26	2.69	0.331	1.455	1.79
Georgia	6.95	1.94	0.333	0.469	0.80
Kazakhstan	269.7	185.10	18.994	3.556	22.55
Kyrgyzstan	19.18	9.36	0.238	1.072	1.31
Tajikistan	13.99	3.20	0.208	0.722	0.93
Turkmenistan	46.99	30.70	0.400	1.800	2.20
Uzbekistan	42.54	22.22	0.419	4.281	4.70
Total	410.44	256.05	21.137	13.641	34.78

Source: FAO, *Compendium of Food and Agriculture Indicators*, 2006; FAO STAT, 2006.

Table 1b. Importance of agriculture in the CAC region

CAC Country	Total population (mln, 2004)	Percent of rural population of total	Percent share of agriculture in total GDP and employment (2004)	
			GDP	Agric. employment
Armenia	3.052	37	24.7	11
Azerbaijan	8.447	50	12.3	25
Georgia	5.074	48	17.9	18
Kazakhstan	15.403	45	7.6	16
Kyrgyzstan	5.208	66	33.3	23
Tajikistan	6.298	76	21.6	31
Turkmenistan	4.490	54	21.0	32
Uzbekistan	26.479	64	30.8	25

Source: FAO, *Compendium of Food and Agriculture Indicators, 2006*; FAO STAT, 2006.

Table 2. Production dynamics of main crops in Central Asian countries in 1992 and 2005

Major crops		Kazakhstan		Kyrgyzstan		Tajikistan		Turkmenistan		Uzbekistan	
		1992	2005	1992	2005	1992	2005	1992	2005	1992	2005
Cotton	Area, mha	0.11	0.19	0.02	0.05	0.29	0.29	0.57	0.60	1.67	1.39
	Prod., mt	0.23	0.35	0.04	0.15	0.53	0.49	1.18	0.66	3.86	3.79
	Yield, t/ha	2.10	1.80	1.90	3.20	1.80	1.70	2.10	1.10	2.30	2.70
Wheat	Area, mha	13.72	11.50	0.25	0.42	0.18	0.32	0.20	0.90	0.63	1.40
	Prod., mt	18.29	11.10	0.68	0.95	0.17	0.63	0.38	2.83	0.96	5.75
	Yield, t/ha	1.30	1.00	2.70	2.20	0.90	2.00	1.90	3.10	1.50	4.10
Rice (paddy)	Area, mha	0.12	0.08	0.00	0.01	0.01	0.01	0.03	0.05	0.18	0.05
	Prod., mt	0.47	0.31	0.00	0.02	0.02	0.05	0.06	0.12	0.54	0.15
	Yield, t/ha	4.00	4.10	1.50	2.90	2.00	5.20	2.30	2.40	3.00	3.20
Barley	Area, mha	5.63	1.50	0.26	0.10	0.06	0.05	0.06	0.07	0.30	0.11
	Prod., mt	8.51	1.55	0.62	0.21	0.04	0.06	0.13	0.07	0.29	0.10
	Yield, t/ha	1.50	1.00	2.40	2.10	0.80	1.30	2.10	1.00	0.90	0.90

Source: FAO, *Compendium of Food and Agriculture Indicators, 2006*; FAO STAT, 2006.

6. Changes of the magnitude described above have had a considerable impact on agricultural research and rural development. Most of the national agricultural research systems are presently meagerly funded in the CAC region and, therefore, can benefit from each other for exchange of information and dissemination of agricultural technologies. It is worth mentioning here that all these countries have inherited a wealth of research experience from the Soviet Union which provided these republics fairly good foundation to build-on collaborative agricultural research. The countries of CAC have a rich experience of cotton/cereal-based integrated livestock farming production systems practiced in irrigated and rainfed environments of the plains and the highlands/mountain regions. The core of nature protection philosophy recognizes the fact that water in dry areas determines the landscape, life, biodiversity and sustainability of the fragile natural resources. Basic components of the problem-solving technologies necessarily do not have to be site specific but must represent unvarying objectives that are developed to extend them efficiently across all production conditions. Conservation agriculture (CA)

technologies introduced recently into CAC by ICARDA and CIMMYT provide a good example. Solutions to some of complex natural resource management problems have trans-boundary domains as for example hydro-salinity and climate change. This suggests that such problems could be better addressed by joint regional actions.

Purpose of Regional Needs Assessment

7. The key purpose of the regional research priority setting and integration exercise, launched in CWANA by ICARDA was to lay the foundation for a renewed NARS-NARS and NARS-CGIAR partnership for tackling common agricultural priorities that can be best handled on a regional or sub-regional scale. Earlier need assessment workshops provided a wealth of information about the in-country specific agricultural research needs for sustainable management of land and water resources and conservation of agricultural biodiversity for improving the efficiency of crop and livestock production systems. The basic premise of ascertaining the regional needs was to setup a process that would strengthen NARS-NARS partnerships (bilateral or multilateral) and create opportunities for an efficient division of labor and other resources for a greater impact on the livelihoods of the rural and urban poor who depend on agriculture (Belaid et al. 2003).

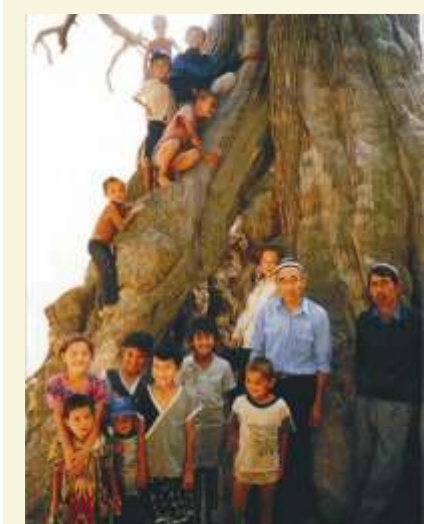


Figure 3. Common vision for surmounting new challenges

Priority Setting Process Cycles and Some of the Major Outcomes

8. ICARDA in association with the CAC-NARS had earlier organized the Need Assessment meetings in 1995 and 1996 which led to the establishment of the CAC Regional Program involving eight countries and nine CG centers. These efforts also led to endorsement by the CAC policy makers of greater support for agricultural research and development.

9. Subsequent priority setting exercises were undertaken in September 2001 in Tashkent and May 2002 in Aleppo. In these exercises, earlier identified priorities were revisited to find a global context and integrate them into CGIAR agenda for research. Based on revised analysis of constraints and opportunities for agricultural research and development in the CAC region, identified priorities were grouped into four thematic clusters of three priorities as given in Table 3. It was also emphasized that in

Table 3. Research priorities for Central Asia and the Caucasus

Priority	Germplasm Management	Natural Resource Management	Socio-economics	Cross-cutting Issues
Priority 1	Germplasm improvement and biotechnology Genetic resource conservation	Water, Soils Rangelands	Marketing, commerce and trade, Post-harvest technologies	Human resource development, Capacity building, Information & communication technology
Priority 2	Seed production Diversification	Biodiversity	Quality & added value; Institutional policies	Intellectual property rights, Crisis & risk management
Priority 3	Integrated pest management	Integrated crop management	Impact assessment	Biosafety and quarantine Indigenous knowledge

Source : Belaid, A., M. Solh and A. Mazid (2003); Paroda, R. (2007).

view of the state of poverty, natural resource degradation, and the level of food insecurity, CGIAR should consider its involvement in Central and West Asia and North Africa (CWANA) region, in addition to Sub-Saharan Africa and South Asia. The next step for CGIAR was to identify a niche within the regional research agenda that provide opportunities to CG Centers to work together with the NARS on problems of mutual interests.

Why is the CAC Regional Needs Assessment Cycle 2007 Separate from the WANA Region?

10. In view of the rapid changes around the world (globalization of markets and its market dimensions, recent progress in science, especially in biotechnologies, renewed focus on rural development, provision of policy and technical support to subsistence or family producers, new agri-food research paradigm - from farm to the fork (from production to consumption) and information technology revolution, the time dimension of the identified agricultural research priorities is of crucial importance. Setting the regional priorities is necessarily a dynamic and evolutionary process to be revisited in the light of regional and global changes taking place around the CAC. In 2006, during the Round Table Discussions held in Tashkent on the ICARDA Strategic Plans for Dry Areas in the CWANA Region, priorities identified in 2002 were revisited for an alignment with the new CGIAR Agenda and the Millennium Development Goals (MDGs). In the round table discussions, CAC national partners reaffirmed the priorities identified earlier. It was also strongly emphasized that CAC region should be dealt separately because several features distinguish it from West Asia and North Africa (WANA) region. An outline of key distinguishing features between CAC and WANA regions that need separate treatments are given in Table 4.

Table 4. Distinguishing characteristic features of CAC and WANA regions

Central Asia and Caucasus (CAC)	West Asia and North Africa (WANA)
i. Good potential for food export and sufficiency	i. Likely to depend for food on others
ii. Water management, not availability, is a major problem; ground water considered as reserve	ii. Water availability is a major issue; ground water is being exploited for agricultural and other uses in national economies
iii. Salinity is another problem area	iii. Recurrence of droughts is a problem
iv. Livestock development leading to rangeland degradation	iv. Livestock development and rangeland degradation are also important issues
v. Inadequate mechanisms for transfer of technologies, involvement of NGOs and private sector investments	v. Natural desertification processes
vi. Rich genetic diversity in crops and animals	vi. Relatively less genetic base than CAC

11. A 'Regional Research Needs Assessment' Workshop was convened in Tashkent in March 2007 to involve the eco-regional fora such as CACAARI, APAARI, AARINENA, together with GFAR, farmer associations and private sector organizations. It provided a unique opportunity for developing a common vision on the nature and extent of agricultural problems. Participants revisited the CAC regional priorities and defined the needs for agricultural technologies/information for improving the productivity of the prevalent farming systems for improved livelihoods of the people who depend on agriculture. The earlier initiatives of ICARDA and the CGIAR had laid sound foundations for effective agricultural research for sustainable development of the region. Now in the CAC region, CG centers are addressing 13 out of 20

Table 5. CGIAR priorities being addressed by the CAC Program

1. Sustaining biodiversity for current and future generations	2. Producing more and better food at lower cost through genetic improvements	3. Reducing rural poverty through agricultural diversification and emerging opportunities for high-value commodities and products	4. Promoting poverty alleviation and sustainable management of water, land and forest resources	5. Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger
1A. Promoting conservation and characterization of staple crops	2A. Maintaining and enhancing yields and yield potential of food staples	3A. Increasing income from fruits and vegetables	4A. Promoting integrated land, water and forest management at landscape level	5A. Improving science and technology policies and institutions
1B. Promoting conservation and characterization of underutilized plant genetic resources	2B. Improving tolerance to selected abiotic stresses	3B. Increasing income from livestock	4B. Sustaining and managing aquatic ecosystems for food and livelihoods	5B. Making international and domestic markets work for the poor
1C. Promoting conservation of indigenous livestock	2C. Enhancing nutritional quality and safety	3C. Enhancing income through increased productivity of fisheries and aquaculture	4C. Improving water productivity	5C. Improving rural institutions and their governance
1D. Promoting conservation of aquatic animal genetic resources	2D. Genetically enhancing selected high-value species	3D. Promoting sustainable income generation from forests and trees	4D. Promoting sustainable agro-ecological intensification in low- and high-potential areas	5D. Improving research and development options to reduce rural poverty and vulnerability

Source: CAC Annual Reports (2003-06).

12. For the region as a whole, previously identified research needs for sustainable rural development were more of generic nature and comprised the thematic areas such as (i) conservation of genetic resources, (ii) productivity enhancement and seed enhancement, (iii) soil and water management, (iv) livestock improvement, (v) crop diversification, (vii) post-harvest management, (viii) technologies for mountainous region (ix) socio-economic and policy issues, and (ix) human resource development.

13. Based on the country reports, the ensuing deliberations led to sorting out the basis of regional commonalities, and were listed as such as regional problems requiring attention of several countries and hence of the global communities. A summary on the regional nature of the occurrence of natural resource management (NRM) problems in the CAC countries are given in Table 6 in different thematic areas.

Table 6. Occurrence of thematic NRM problems and priorities in the CAC countries

Country	Genetic enhancement	Livestock breeds	Land degradation	Water manage.	Biodiversity conserve. †	Seed issues	Mountain agric.	Crop diversi.
Armenia	√	√	√	√	√	√	-	√
Azerbaijan	√	Ca,S,B	√ (E,SI)	√	√	√W,Dw,L	√	√
Georgia	√(W,C)	√	√ (E,SI)	√	√T,Gr,Ct	√ W,L	√	√
Kazakhstan	√ (R,C,W, Sy)	Ca,H,S	√ (E, SI)	√	√	√C,W,O		√
Tajikistan	√(W,C, V)	Ca,Cm,H	√ (E,SI)	√	√	√	√	√
Turkmenistan	√ (M, A)	Ca	√ (E,SI, SF)	√	√	√	√	√
Kyrgyzstan	√(A, S, Sy)	Y,G,S	√ (E,RL,SI)	√	√	√	√	√
Uzbekistan	√ (R, C)	Ca, S	√ (E,SI)	√	√	√crops	-	√

Symbol √ refers to research need in the thematic area and letters within the parentheses indicate specific disciplines.

SI= salinity, E= erosion wind/water, RI=rangelands, SF=soil fertility.

Crops: A= alfalfa, C=cotton, Dw= durum wheat, Gr=grapes, L= grain legumes (lentil, chickpea, dry peas), M= melon, O= oilseed crops (rapeseed, safflower), S= sainfoin, R=rice, Sy= soybean, P= pepper, T=tea, V= vegetable crops (potato, tomato, cucurbits, cabbage, cauliflower, onion, garlic, peas, beans), W= wheat,

Animal: Ca= cattle, B= buffalo, Cm= camel, G= goat, H= horse, K= karakul sheep, S=sheep, Y= yak.

† Each Country has a Gene Bank for germplasm evaluation, assessment and use, the overarching problem for the region is gene mining using biotechnological tools. The other overarching thematic issues relate to human resource development and weak socio-economic and policy links, and inadequate farmer participatory research approaches.

14. Although thematic issues such as genetic enhancement and conservation of genetic biodiversity, degradation of land due to erosion forces and salinity, water management, seed and crop diversification



Figure 4. Dual purpose wheat for grain and green fodder

dominated as common priorities for the whole CAC region. Other key issues such as agriculture on sloping lands to stop out-migration from mountainous regions and specificity of crop and livestock related issues also came to the fore. In relation to crop diversification theme, questions such as where to diversify and with what crop to diversify (bio-climate and market options) and how (technical options) should serve guidepost for diversification under specific locations. It implied that agricultural innovations oriented toward enhanced productivity and sustainable livelihoods

have to be based on conservation and development of local and indigenous knowledge-based practices and social norms. The problem is a bit compounded by the transformations taking place in the region. From the deliberations in the RNA meeting, it came out clearly that farmer-participatory research approaches, if given a major push in the on-going reform process across the CAC region, will accelerate the pace of technology generation and transfer processes, and would help bridge the digital divide.

15. In order to further refine the research needs, the RNA meeting was disaggregated into three major groups to deliberate on the detailed regional problems that are amenable to solutions in the regional frameworks. These groups discussed problems under the broad thematic areas such as: (i) Genetic Resource Management, (ii) Natural Resource Management, and (iii) Socioeconomic, Policy Research and Capacity Building, and attempted to identify possible partners in addressing these issues in the CAC region in collaboration with the NARS.



Figure 5. RNA Meeting in Tashkent, March 2007

Recommendations on Genetic Resources Management (GRM)

Several food, fibre, vegetable, fruit and fodder crops are considerably of high economic significance for the CAC region as a whole. These include wheat, cotton, alfalfa, fruits, grapes, potato, and vegetables (tomato, cucumber, pepper, etc.). Research was considered of high priority for resolving the existing and emerging constraints limiting efficient PGR management and germplasm improvement in the CAC region. The need for enhancing collaboration between the CAC countries as such and with the international organizations was clearly identified as an over-arching issue for mining and utilization of useful genes for enhancing productivity of the farming systems in the region. In the thematic area of GRM, six subsets of researchable priorities were identified in the following six areas related to plant and animal genetic resources:

1. Exchange of genetic resources
2. Documentation of information on genetic resources
3. Conservation of genetic resources
4. Germplasm enhancement
5. Need for a regional strategy on the use of biotechnological tools in crops
6. Conservation, documentation, enhancement & utilization of animal genetic resources

1. Exchange of Genetic Resources

- Standard material transfer agreement (SMTA), as by ITGRFA-FAO, are adopted for speedy exchanges.
- Capacity building for Sanitary and Phytosanitary (SPS) Regulations in PRA (Pest Risk Analysis).
- Development of unified quarantine standards and testing systems for new breeding/germplasm materials.

2. Documentation of Information on Genetic Resources

- Capacity building in the use of new tools and technologies:
 - Geo-information systems (GIS),
 - DNA-fingerprinting, etc.
- Documentation of germplasm and publication of catalogues

3. Conservation of Genetic Resources

- Accelerate the pace of germplasm collection missions to make up for existing deficiencies/gaps in priority crops, especially for their wild relatives and landraces
- Strengthening *ex situ* conservation in Gene Banks
- Capacity building for PGR conservation, evaluation and use
- Strengthening *in situ* conservation in selected priority crops
- *In vitro* conservation practices (tissue/cell culture, micro-propagation, cryo-conservation)
- Monitoring and regeneration of valuable collections/old varieties/landraces
- Evaluation for resistance to biotic and abiotic stresses under epiphytotic conditions, genetic potential

4. Germplasm Enhancement

- Strengthening of crop improvement programs in economically important crops for quality, early-maturity, salt and drought and cold tolerance, resistance to diseases and pests in
 - wheat, and food legumes
 - potato, tomato, cucumber
 - pepper, grapes, and
 - alfalfa
- Exploitation of heterosis (hybrids) for cotton, rice and maize for better productivity
- Testing, identification and use of salt-tolerant plants (alfalfa, rice, sorghum, pearl millet, barley, amaranth, salt bush (*Atriplex*) and tree species)
- Capacity building for use of marker-assisted selection and other advanced biotechnology tools and methods. Policy advocacy for strengthening current breeding efforts (plants and animals)



Figure 6. Clonal selection in potato in CAC

5. Need for a Regional Strategy on Use of Biotechnological Tools in Crops

- Cotton, soybean, potato
- Biosafety regulations in partnerships with national and international research organizations
- Clear regional strategy/positions relating to testing and use of GM crops
- Partnership and collaborating mechanisms among Gene Banks, PGR, research institutes, botanical gardens, animal farms, breeding stations, universities, international centers and support of international organizations (FAO, CGIAR Centers, etc.), NGOs, funding agencies (such as GCDT, Sida, ACIAR, USAID, etc.), private sector, etc.
- Capacity building of national systems

6. Conservation, Documentation, Enhancement & Utilization of Animal Genetic Resources

- Especially small ruminants
- Documentation and conservation of unique breeds of sheep, horse, camel and yak

Recommended Partnerships: NARS of CAC countries; CIMMYT, ICARDA (wheat and maize); CIP (potato); IRRI (rice); ICARDA, BIOVERSITY INTERNATIONAL, AVRDC, ICRISAT (legumes); AVRDC (vegetables); BIOVERSITY INTERNATIONAL (fruits); ICARDA (barley).

Active support of FAO relating to implementation of Treaty (ITGRFA), Global Plan of Action and advocacy role for strengthening of breeding programs through conservation and effective use will be highly desirable, including biotechnology, biosafety, IPR-related issues, which have become very important in the present context.

Recommendations on the Natural Resources Management (NRM)

It may be highlighted here that Policy and Capacity Building were over-arching themes for resolution of the regional Natural Resource Management (NRM) problems.

In the area of NRM, regional problems were classed according to the following themes:

- Management of saline environments
- Water management, water use efficiency and water quality in irrigated and dry land and rainfed areas
- Crop diversification
- Land and water degradation - loss of biodiversity and soil fertility
- Pasture and rangeland management
- Environmental quality and futuristic research:
 - Climate change adapting to climate change
 - Carbon sequestration, agroforestry and afforestation



Figure 7. Salinity-affected area remediated using salt-tolerant crops

1. Management of Saline Environments

- Geo-referenced soil salinity assessments and prognosis of secondary salinization in saline seep areas/irrigated areas
- Assessment of cyclic salts/aerosols from Aral Sea
- Crop losses due to salinity in river basins
- Water quality standards for different cropping systems
- Land Reclamation
 - Role of Rice-Wheat (R-W) systems and salt leaching
 - Crops, cropping systems, crop cultivar choices
 - Need for amendments
 - Biodrainage, halophytes and crops (alfalfa, rice)
 - Screening of salt-tolerant crop species

Recommended Partnerships: NARS of CAC, ICARDA, IWMI, ICBA, IRRI and FAO.

2. Water Management, Water Use Efficiency and Water Quality in Irrigated and Dryland/Rainfed Areas

- Optimizing and determining improved irrigation systems: design parameters for various conditions
- Cropping system choices (crop selection and selection of water stress-tolerant crops)
- Deficit irrigation
- Conjunctive use of surface, ground and drainage waters
- Irrigation scheduling for multi-quality waters
- Supplementary irrigation in rainfed areas
- Management of crops residues in Conservation Agriculture for soil/water conservation, fine-tune irrigation and fertilizer practices.

Recommended Partnerships: NARS of CAC countries, ICARDA, IWMI, IFPRI and FAO

3. Crop Diversification

- Introduction of agri-horticulture/forestry
- Introduction of legumes and new crops - rice, soybean, mungbean, alfalfa, rapeseed, chickpea, field (dry) peas, safflower, etc.

Recommended Partnerships: NARS of CAC countries, ICARDA, IWMI and Bioversity International

4. Land and Water Degradation - Loss of Biodiversity and Soil Fertility

- Assessment of wind and water erosion and geo-reference 'hot spots' and other critical areas for priority treatments
- Assessment of the dynamics of river water quality - salinity, other pollutants
- Assessment of traditional conservation technologies and improving them for enhanced efficiency
- Introduction of conservation agriculture (zero till, raised-bed planting, contour, etc)
- Crop residue management, controlled traffic, etc., and fertilizer practices)
- Agro-forestry/agri-horticultural, cover crop systems for improved livelihoods and soil and water conservation



Figure 8. Good rangelands for better livelihoods

- Role of legumes in managing soil fertility - including fertilizer practices in presence of crop residues, conservation agriculture.

Recommended Partnerships: NARS of CAC countries, ICARDA, IWMI, ICBA, CIMMYT, IRRI, IFPRI, ICRAF and FAO

5. Pastures and Rangeland Management

- A geo-referenced assessment and monitoring of pastureland degradation
- Rangeland management/ grazing, etc.
- Rehabilitation of rangeland (residuals, water harvesting, protection)
- Increase productivity of rangelands for integrated livestock production (fertilizer use, agro-forestry/horticulture and livestock, etc.)

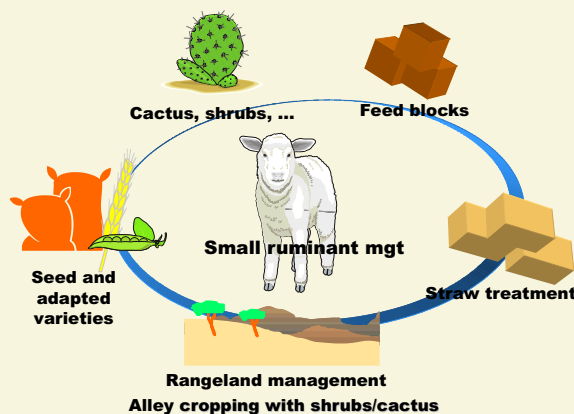


Figure 9. Alternate fodders and feeds for better livestock

Recommended Partnerships: NARS of CAC countries, ICARDA, ICBA, IWMI and FAO

6. Environmental Quality Concerns

- Assessment of cyclic salts/aerosols from Aral sea and its effect on environment
- Assessment of crop losses due to salinity in river basins and salinity management
- Water quality standards for continental dry areas for different cropping systems
- Reuse of low quality water (saline, drainage and sewage)
- Greenhouse gas (GHG) emissions through residue burning
- Carbon sequestration potential of CAC role of shelter belts and forage grasses.



Figure 10. Zero-till raised bed planted mulched cotton

Partnerships: NARS of CAC countries, ICARDA, IWMI and FAO

Recommendations on Socioeconomic, Policy Research and Capacity Building

Both internal and external developments have affected the agricultural research in the CAC region since the last priority-setting exercise. Therefore, it is important to critically revisit the earlier priorities. This will ensure convergence of the 'top-down and 'bottom-up' approaches such as to ensure timely response to

the regional research needs of the changing economies in CAC countries. Revisiting was also considered crucial for alignment of the regional priorities in tune with the UN Millennium Development Goals (MDGs) and as well as the new CGIAR priorities. In doing this, it should be understood that socioeconomic, policy research and capacity building complement and work closely together with biophysical research in agriculture. The idea is not to include just new activities as priority, but also assess comparative advantages of different possible partnership opportunities for implementing them.

Keeping above in mind, discussions were structured so as to facilitate active inputs from the participants on topics including (i) revisiting earlier priorities, (ii) identifying existing gaps, and (iii) identify new emerging issues in CAC.

Brainstorming of the socioeconomic, policy and capacity building aspects of the previously identified regional priorities also led to identification of the cross-cutting issues in different thematic areas such as: (i) Capacity Building, (ii) Extension and Knowledge Sharing, (iii) Legal Frameworks, (iv) Gender, (v) Investment Opportunities, (vi) Livelihoods and Poverty Studies, and (vii) Adoption and Impact Assessment. In addition, other researchable issues that were of significant importance to the region included: (i) Competitiveness and globalization, (ii) Impact of climate change, and (iii) Reorientation of agricultural innovation systems (Research +Extension +Farmers).

Following the synthesis of the researchable issues in the context of socioeconomic and policy research, and capacity building, the following priorities were identified as the most important for the CAC region. This prioritization is based on the potential contribution of selected priorities to food security improvement, poverty reduction, natural resources conservation, and regional integration enhancement.

- Capacity building
- Extension and knowledge transfer
- Legal frameworks
- Gender research
- Livelihoods and poverty analysis
- Adoption and impact assessment
- Enabling policy options
- Land tenure
- Local institutions
- Marketing, competitiveness and trade
- Reorientation of agricultural innovation systems

Recommended Partnerships: Strengthened partnership between CAC-NARS and CG Centers, FAO/UN, and GFAR.

The Next Steps

The regional needs assessment (RNA) workshop identified three broad themes, namely, (i) Genetic resources management (GRM), (ii) Natural resources management (NRM), and (iii) Socioeconomic, policy research and capacity building (SEPCAB) which are composed of a total of 23 sub-themes. Each sub-theme, in-turn comprises of a set of topical priorities on which actions have to be planned to address issues of genetic- and natural resource conservation and management within the social fabric of the societies in each of the CAC countries.

One of the logical next steps for implementing the outcomes of the RNA workshop is to share the recommendations on regional needs assessment with the National Coordination Councils of the CACILM

Program (Central Asian Countries Initiative for Land Management) in each republic. Each country can then plan how best to integrate the RNA recommendations within the National Programming Frameworks for leveraging funds for research and development under CACILM.

For moving forward, knowledge of the strategic entry point(s) and a sound approach to the problem/solutions is required to integrate peripheral activities which affect the livelihoods of the farm-households and the landless. Experiences from different regions point out that conservation agriculture (CA)/Resource Conservation Technologies (RCT)s should form an important component of the regional strategy for food security and poverty alleviation, health for all, enhancing productivity, rural development, improving environmental quality and preserving natural resources. Early results from the CAC region and the nearby region of South Asia strongly indicate that conservation agriculture can serve as an excellent strategy for resolution of the research and developmental problems in the CAC region. It also helps to serve the irrigated and rainfed farmers, integrate crop-livestock-aquaculture in farming system approaches and enhance and conserve the quality of the natural resources. Similarly, RCTs can help produce more at less cost, promote crop diversification and intensification, and conserve the natural resource base.

In order to translate recommendations into 'Action Plans' it is only prudent that farmers are kept at the center stage. It is always crucial to understand the farmers' perspectives on the critical gaps and options for technology generation and the market needs. Then, farmer-participatory approach could be very useful for accelerating the pace of technology generation, adoption and dissemination through farmer-farmer exchange of information. Such an approach is particularly suited when the research-extension-farmer linkages are weak, which is presently the case in the CAC region as a whole. In order to assess the farmers' and market needs, the following is suggested:

1. A pilot study on the research-extension-farmer linkages which would be a logical step forward in the right direction. This may be carried out in collaboration with CACAARI, ICARDA and FAO with very active participation of farmer association representatives.
2. A follow-up workshop to discuss the results of the pilot study to come up with the action plan to create and strengthen the research-extension-farmer linkages in the CAC countries.

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