

# CGIAR COLLABORATIVE RESEARCH PROGRAM FOR CENTRAL ASIA AND THE CAUCASUS

## ANNUAL REPORT<sup>1</sup> (2003-2004)

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### 1. INTRODUCTION

The CGIAR Consortium for sustainable agricultural development in Central Asia and the Caucasus, involving ten CG Centers (CIMMYT, CIP, ICARDA, ICRISAT, IFPRI, ILRI, IPGRI, IRRI, ISNAR, IWMI), is serving the needs of all the eight National Agricultural Research Systems (NARS) of Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan since September 1998. The key objective is to achieve increased productivity of crops and livestock through generation and transfer of sustainable production technologies, while ensuring proper natural resource management.

The CGIAR Consortium for Central Asia and the Caucasus is being facilitated by ICARDA as the Lead Center. Four CGIAR Centers, namely ICARDA, CIMMYT, IPGRI and IWMI have established their offices in the region and are expanding their collaborative research activities. PFU is also providing need based support to other CG partners in the Consortium for their research activities in the region. IRRI, which became the tenth partner in 2002, has also expanded its activities, whereas CIP has decided to include CAC region in its Asian program for additional research support. Other International Centers, such as International Center for Biosaline Agriculture (ICBA), Dubai and the Asian Vegetable Research and Development Center (AVRDC), Taiwan have also proposed to join the Consortium.

During the last five years, through a bottom-up approach involving scientists from national programs as partners, considerable progress has been made in the area of collaborative research, national research organization and management, human resource development and the promotion of research networks. Collaborative research is mainly aimed at:

- (a) varietal improvement and seed production,
- (b) on-farm water use efficiency and new agronomic practices,
- (c) feed and livestock management,
- (d) genetic resource conservation, and
- (e) strengthening of NARS.

This report highlights in brief the various activities carried out by the Consortium partners during the year 2003-2004.

### 2. GERMPLASM ENHANCEMENT

Research activities on germplasm enhancement have focused on testing different crop varieties to identify promising breeding materials with resistance to both biotic and abiotic stresses.

Under this collaborative program, eleven promising varieties consisting of winter wheat (7), winter barley (1), spring barley (1), chickpea (1), and lentil (1) have already been released in the region

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based on their superior performance. These varieties have recorded consistently higher yield with superior quality and disease resistance over the local checks.

In addition, more than 45 promising varieties of different crops are presently being tested in the State Varietal Trials (SVT), and are awaiting decisions for their release and wide scale adoption (Annexure I). As is evident, practically in all the 8 CAC countries, the new improved breeding material has been identified, which is used either for crossing with the national breeding material or for direct selection, multiplication and adoption on farmers' fields.

## **2.1 Winter Wheat Improvement**

Wheat is the most important cereal crop in the region. Since independence, almost all countries have laid considerable emphasis on increased wheat production for attaining food security. Thanks to the efforts of policy makers, scientists and farmers, a number of countries such as Uzbekistan, Tajikistan, Kyrgyzstan, Turkmenistan and Azerbaijan have almost attained self-sufficiency in wheat production during the last three years, whereas Kazakhstan is already a major wheat exporter in the region.

In most of these countries, wheat varieties are old which were either released about a decade ago or the ones that are mostly introduced from Russia. Many of these varieties have also become susceptible to yellow rust. The collaborative program on wheat involving Turkey-CIMMYT-ICARDA has provided much needed support through the Consortium for testing of improved germplasm material and release of high yielding varieties. As a result, presently around 26 bread wheat varieties are being officially tested for their final evaluation in all eight countries of the region (Annexure I). It is encouraging that by now seven varieties have officially been released: Mtskhetskaya 1 in Georgia; Nurlu 99 and Azametly 95 in Azerbaijan, Jamin, Zubkov and Azirbosh in Kyrgyzstan and Dostlik in Uzbekistan.

Being early maturing, varieties Azametly-95 and Nurlu-99 have potential to produce almost 7.0-8.0 t/ha. Seed production of these varieties was undertaken at the Azerbaijan Research Institute of Crop Husbandry and farmers' fields since 2002. Already around 1,400 ha area is covered under these two varieties. It is planned to have about 20 tons of seed distributed this year to the farmers in different areas of Azerbaijan.

In Kyrgyzstan, variety Jamin, a facultative wheat, has also been released recently for mountainous areas in Issyl-Kul and Naryn Provinces. Besides being early maturing and high yielding, Jamin is the first facultative wheat variety released in Kyrgyzstan to replace Intensivnaya which was released in 1998. Having productivity potential of about 6.0 t/ha, it is resistant to yellow rust and hence, may replace soon the predominant variety Intensivnaya, grown presently on 50% of total area under wheat in Kyrgyzstan, since the latter has now become susceptible to yellow rust. This year, it is expected to have about 70 tons of seed produced of this variety.

Variety Dostlik, released in 2002 in Uzbekistan, has performed exceedingly well in drier and salt affected areas. Initially, ICARDA procured 5 tons of seed from Turkey and Tajikistan during 2001, which catalyzed the process of its release in 2002 and wide scale adoption. It is expected to have about 1000 tons of seed produced this year for large scale distribution to the farmers in Syrdarya, Djizzak and Fergana Provinces. It is expected that another winter wheat varieties Ravat and Grecum 2002 will be released in the near future in view of their superior performance and resistance to yellow rust under irrigated conditions of Uzbekistan.

In Georgia, seeds of variety Mtskhetskaya-1 were provided to six farmers for the large scale seed multiplication during the current year. About 20 tons of seed is expected to be harvested this year.

In partnership with the national programs and other organizations, CIMMYT worked towards enhancing both productivity and stability of wheat through the generation and transfer of system-efficient germplasm and sustainable production technologies. Some of these were:

- The winter wheat breeding and seed network established through the GTZ-CIMMYT regional project continued successful operation resulting in a structured exchange of germplasm, varieties, information, expertise and seed.
- The bed-planting technology of irrigated wheat cultivation has been tested both on-station and on-farms and proved to be very successful especially for seed production. The regional workshop conducted in 2003 with participants from six countries summarized the results and developed an action plan for extending the technology to the farmers. Beside yield increase and water use efficiency, this technology saves seed rate by almost half (around 125 kg/ha instead of 250 kg/ha), thus reducing considerably the production cost for the farmers.
- Introduction of zero tillage research and on-farm demonstration under the FAO-CIMMYT project in Kazakhstan showed both the advantages and the challenges of the new technology.

## **2.2 Barley Improvement**

Barley is the second most important grain crop after wheat in the region. It is grown mainly in Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan and Azerbaijan. Based on testing over the last five years, the barley breeders of CAC countries have identified some promising lines from ICARDA nurseries. Many of the promising lines have widely been used in breeding programs, as source of valuable traits including quality. Following is a brief account of countrywise progress:

In Northern Kazakhstan, varieties Batyr-1 and Batyr-2 have performed well during the last three years showing an yield increase of 20-30% over control variety Akmolinskaya-25. These varieties have been submitted to the SVT Commission in 2002 for further testing and release. 800 kg seed of Batyr-1 and 760 kg of Batyr-2 have been planted this year for further seed multiplication.

In Southern Kazakhstan, Krasniy Vodopad Breeding station is responsible for the improvement of winter barley. Three varieties (Aziret-114, Sultan-118, and Ortai-111) were selected from ICARDA nurseries. Ortai-111 has demonstrated good resistance to diseases, pests and lodging. It was also found to be cold tolerant with large seed size. 500 kg each of these varieties have been planted this year for seed multiplication. In October 2003, a new variety "Zhibek Zholy" (Silk Road) was also submitted to the SVTC. During the last four years, this variety has out yielded the standard check (Bereke-54) by almost 34%.

Barley breeders in Azerbaijan have succeeded in identifying a new promising variety Baharly. During the last 3 years, Baharly has out-yielded the local check Tiklon by 35-40%. Last year, 5 tons of Baharly seed was produced. Baharly is expected to be released soon in Azerbaijan. All available seeds of this variety have been planted for further seed multiplication this year.

The joint research efforts have resulted in the identification of the new promising lines of spring and winter barley in Kyrgyzstan. The best variety has been named as Adel (MV-46/Mazurka/3/Roho//Alger/ Ceres), which out-yielded the standard check Osnova by 20-25% in the advanced yield trials. 10 tons seed of variety Adel is being further multiplied on farmers' field this year.

Barley breeders in Turkmenistan have also selected some good varieties of barley. During the last 2 years, these varieties have shown advantage for disease resistance, heat and drought tolerance, and productivity. Seeds of three promising varieties: Sonata, Alpha/Dura and Lignee-131 have been planted this year for further seed multiplication.

Uzbek breeders from Galla-Aral Research Center have also identified three promising lines of barley for rainfed conditions. These are: Arizona 5908/Aths//Avt/; 7028/2759/3/6982//Ds/ and Arar/Lingnee527//Arar/Rhn. These lines have distinct advantage for disease resistance, heat and drought tolerance. They have out-yielded local check Lalmikor by 20-25%. All these varieties have been planted this year for further seed multiplication.

In addition, a special barely nursery, including 767 lines, was planted in fall, 2003 at the Krasniy Vodopad Breeding Station (KVBS), Kazakhstan and Gala-Aral Station, Uzbekistan. As a result, a number of cold tolerant barley lines have been identified. The selected accessions will be used now in the hybridization work.

### **2.3 Legume Improvement**

Food and forage legumes have good scope for crop diversification in Central Asia and the Caucasus, especially in Uzbekistan, Kazakhstan, and Azerbaijan. Therefore, ICARDA laid special emphasis on food and forage legumes testing, resulting in a number of promising varieties for large scale state varietal testing and release.

#### *2.3.1 Food legumes*

A number of international nurseries have been tested in CAC countries such as: chickpea-4 nurseries (188 entries), lentil-4 nurseries (96 entries), vetch-2 nurseries (32 entries), faba bean-1 nursery (8 entries) and lathyrus-1 nursery (16 entries). The details of promising varieties of chickpea and lentil, identified for advanced testing, are given in Annexure I.

In Kazakhstan, a number of varieties have been identified as promising. They meet most of the farmers' requirements such as high yield, white grain color, large seed size, cold resistance, etc. The selected lines were tested under two sowing dates: during fall in plains and during winter in foothills. Promising variety FLIP 94-52C is being multiplied currently in an area of 3.5 ha.

In Northern Kazakhstan (Shortandy), a promising lentil line ILL-6037 was selected based on its good performance. About 280 kg seeds harvested and last year will be planted for further seed multiplication.

In Uzbekistan (Andijan), two promising varieties of chickpea: FLIP 98-143C and FLIP 99-4C have been planted for seed multiplication and submission to SVTC. In lentil, variety Lentil 7513 (Oltyn don) has performed well under rainfed conditions of Djizzak Province and has been submitted for final testing to SVTC during 2003.

In Georgia, chickpea line ILC-3279 has been selected from CIDTN-99, which out yielded the released variety Elixir by 25%. In Mtskheta station, two promising lines of lentil from LICTN-98 nursery were selected. Both of them have out yielded local check by 12-15%.

In Azerbaijan, lentil variety Orzu has been selected as promising and its seed is being multiplied at Jalalabad station.

#### *2.3.2 Forage legumes*

Forage legumes, such as vetches and Lathyrus materials were screened for drought in Uzbekistan. Four lines of vetch L-628, L-1004, L-694/1, L-651/2 have been identified as promising. Also, based on the results of the last four years, two promising lines of Lathyrus, IFVN-560 and IFVN-562, have been identified for testing by SVTC in 2004. Turkmen breeders have identified three promising lines

of vetch (IFVN-556SEL2376, IFVN-563SEL 2471 and IFVS-2006SEL2757), one of Lathyrus (IFLS-19SEL444), and one of faba bean (ILB-1266). In Tajikistan, one promising line of vetch (IFVN-561SEL2469), on an average, yielded 3 t/ha. In Kazakhstan, some promising lines of forage legumes have been identified and multiplied for large scale testing. The ICARDA line IFLS 225 Sel 554 performed well during the last three years and gave 16% higher yield. This line has been named as Ali-Bar and was submitted for the official state yield trials in Southern and Central Kazakhstan.

In Azerbaijan, four promising lines of Lathyrus were selected from ILATLS nurseries. One of them, ACC/SEL 273/481, demonstrated good adaptability and gave good yields during the last two years. In 2003, seeds of this variety were planted for on-farm trials. In Georgia, two promising lines namely *Vicia narbonensis* № 2392, originally from Lebanon, and *Vicia villosa* sp DASycARPA-1998 № 2443, originally from Italy, have been selected.

## **2.4 Groundnut Improvement**

During the last five years, ICRISAT has provided germplasm materials of groundnut, including early and medium maturing varieties, with resistance to foliar diseases and drought. Some good confectionery lines were also tested. As a result, a few promising varieties suitable for agro-climatic conditions in the region have been identified for final testing and release.

The results in Tajikistan showed that the highest yielding lines were: C-95322 (3.65 t/ha), C-95248 (3.51 t/ha), C-95242 (3.37 t/ha), C-95290 (3.20 t/ha) and C-94357 (3.16 t/ha). The standard variety yielded 2.88 t/ha. Among medium maturing varieties, the highest yields were obtained from: C-94016 (3.85 t/ha), C-94037 (3.51 t/ha) and C-93143 (3.30 t/ha). The standard variety Tajikistan-15 yielded 3.02 t/ha. Among confectionery varieties, the highest yields were obtained from: C-96066 (3.96 t/ha), C-95163 (3.72 t/ha), C-96234 (3.47 t/ha) and C-96100 (3.34 t/ha). In 2003, two promising varieties of groundnut, C-94016 and C-96066, were submitted for final testing to the SVTC. Seed multiplication of these varieties is planned for 2004.

In view of increased imports, lately considerable interest in groundnut, as well as in other oil crops has increased in Uzbekistan. In this context, early maturing, high-yielding varieties with high oil content suitable for double cropping after winter wheat are urgently needed. A total of 28 groundnut accessions were tested after wheat (June – November). Two varieties ICGV-86155 (“Salomat”) and ICGV-94088 (“Mumtoz”) have been found to be quite promising and submitted to SVTC for final testing and release. “Salomat” is recommended both for planting as a major crop, and also as a second crop in the southern Uzbekistan (Kashkadarya and Surkhandaria Provinces).

In Georgia, 45 new accessions were received from ICRISAT in 2002. They were tested at two locations. In all, 15 accessions showed good results. In August 2003, ICRISAT also supplied one set each of the Ninth International Confectionery Groundnut Varietal Trial (IX ICGVT) and the Ninth International Medium-duration Groundnut Varietal Trial (IX IMGVT(SB)). In 2003, the varietal testing was conducted at the farmer’s fields in village Chkvishi, Imereti Province of Vani district. The average productivity recorded was: for short duration varieties: 1.96 t/ha, medium duration varieties: 1.67 t/ha, and confectionary varieties: 1.71 t/ha.

## **2.5 Support for Rice Research**

Since last two years, IRRI has joined the Consortium and has initiated activities to support rice research in the region. In 2003, major constraints to rice production and the priorities for rice research were identified by a team of 5 senior scientists from IRRI during their visit to Uzbekistan and Kazakhstan. Based on constraints identified, priority has been given to germplasm improvement with emphasis on cold and salinity tolerance, early maturity, crop management and capacity building.

- About 510 IRRI lines were evaluated in UzRRI during 2003. Out of these, 136 lines showed acceptable performance and will be re-evaluated this year as well as used in crossing with local varieties. Seeds of six rice varieties from South Korea (Hwaseongbyeo, Milyang-23, Jinbubyeo, Taebaekbyeo, Sangjubyeo and Odaebyeo) were distributed among rice scientists of six CAC countries. These varieties are now being tested during present cropping season.
- New germplasm will be sent to the region. This will include a 2004 IRTON (International Temperate Rice Observational Nursery with 117 test entries) and also some japonica material developed under the IRRI-Korea breeding program. All new materials will be sent to the region through INGER (International Network for Genetic Enhancement of Rice) network.

#### *Capacity building*

- A 3-day training workshop was conducted in Tashkent during August, 2003 on Rice Production Technologies for Improved Rice Quality. 25 participants from Uzbekistan, Kazakhstan, Turkmenistan, Kyrgyzstan, Tajikistan and Azerbaijan attended the workshop. The participants learned techniques for evaluation of physical and chemical aspects of rice quality and also pre- and post-management practices to ensure better grain quality.
- IRRI sponsored training of 4 scientists, 2 each from Uzbekistan and Kazakhstan for the intensive 3.5 month English course in Tashkent. Out of these four, one breeder from Uzbekistan and one agronomist from Kazakhstan will spend one year each for practical training at IRRI.
- One computer and a printer was supplied to the rice researchers of Priaralski Research Institute of Agroecology and Agriculture, Kazakhstan by CGIAR-PFU.
- The second rice workshop will be held in Kazakhstan at the end of August, 2004, and will cover issues that are of particular importance for rice production in the region: nutrient and water management, varietal improvement, seed production and post harvest technologies. Scientists from all rice growing countries in the CAC are expected to attend the workshop.

## **2.6 Initiatives on Potato Improvement**

In the last two years, CIP has activated its program for potato improvement in the region. In 2003, CIP supplied 11 *in vitro* clones of improved potato varieties to Uzbekistan, Kazakhstan, Kyrgyzstan and Tajikistan from South America for their testing in the region. These varieties were developed by the national potato programs of Argentina (INTA) and Chile (INIA), situated in long day environments, and possess resistance to viruses, which are the major cause of degeneration of potato seed in CAC region.

#### *Capacity building*

- Two senior CIP scientists visited Uzbekistan, Kazakhstan and Tajikistan from 10-21 June, 2003. They met with the scientists of the Uzbek Research Institute of Vegetables, Melons and Potato, the Kazakh Research Institute of Potato and Vegetables and Tajik Academy of the Agrarian Sciences and also visited the farmers' fields to assess the major constraints in potato production in the region.
- CIP in collaboration with PFU had recently organized a Regional Workshop on "Identifying Priorities for Research and Development of Potato in the Central Asian and Caucasus

Countries” in Tashkent, Uzbekistan from 27 - 30 April 2004. About 20 potato scientists from all countries of CAC region (except Armenia) participated in this workshop and helped in identifying specific R&D needs for potato development in entire region, where this crop is grown on almost 0.5 million hectare of area, equivalent to that of South America. Hence, importance of potato towards food security in the region was very much highlighted.

## 2.7 Seed Production

Quality seeds of high-yielding varieties are critical for their further dissemination. Hence, as evident from details provided above under each crop, emphasis was laid on seed development activities in the region. On-farm trials and demonstration plots turned out to be the most important activity for increased agricultural production. The scientists and farmers are now keen to test new varieties. To have an impact on farmers’ fields and for wide spread of promising varieties, efforts have been directed towards seed multiplication in collaboration with NARS partners. Details of seed multiplication activities undertaken in the region especially by ICARDA and CIMMYT in partnership with GTZ are provided in Annexure II.

In view of the increased availability of seeds of new varieties, their large scale adoption is becoming possible in the region. Concerted efforts are being made in this direction in partnership with local breeders in all the eight CAC countries.

## 2.8 Integrated Disease and Pest Management

Activities on IPM are an important part of germplasm improvement. Several surveys have been carried out by the scientists of ICARDA and CIMMYT to study the overall situation in the CAC countries and develop appropriate mechanisms and recommendations for controlling the cereal diseases.

An IPM strategy for yellow rust management has been worked out by studying the race spectrum and identification of resistant genes to be deployed in the breeding programs so as to replace present susceptible varieties. Also a Cereal Leaf Beetle (CLB) nursery in the CWANA region has been established for the first time in Kyrgyzstan for evaluation of resistance of bread wheat lines to CLB.

Yellow rust (*Puccinia striiformis f.sp.tritici*) disease continues to be a significant threat to wheat production in the Caucasus and Central Asia (CAC). In CAC countries, a great diversity in yellow rust population is evolving due to changes in the environment and wheat production systems. Yellow rust emergence and significant yield losses have been observed in Central Asia and the Caucasus over the past four years (1999-2003). Known resistant genes to yellow rust (“Yr” genes) were evaluated for their effectiveness against stripe rust (*Puccinia striiformis*) in five countries in Central Asia (Uzbekistan, Kyrgyzstan, Tajikistan, and Kazakhstan), and in Azerbaijan in the Caucasus. Virulence on Yr 1 and Yr 17 has spread rapidly in Central Asia. The Yr 5 has shown high level of resistance at all sites and over the past five years but has not been exploited yet in the breeding programs. The wheat varieties currently grown in CAC were tested at about 15 different sites over the past 2-4 years. Effective resistance sources were identified in the Turkey/CIMMYT/ICARDA germplasm. Most currently grown varieties have shown high levels of susceptibility to yellow rust at most of the testing sites. Hence, their replacement with resistant varieties would be desirable in the long run.

Surveys of barley and wheat diseases were conducted in Central Asia and the Caucasus (CAC) over the past four years. The surveys covered four countries (Azerbaijan, Uzbekistan, Kyrgyzstan and Kazakhstan), where cereals are of major importance. The primary diseases of wheat observed were yellow rust, tan spot and septoria leaf blotch. Other less prevalent diseases on this crop were leaf rust, common bunt, scab, and powdery mildew. The average incidence of these diseases varied according to the surveyed zone. Yellow rust (*Puccinia striiformis f.sp.tritici*) continues to be the most spread and

important bread wheat disease in Central Asia. The survey in Kazakhstan revealed possible movement of yellow rust from south to north as the wide maturity range of the wheat crop would allow survival of the fungal spores. Late appearance of leaf rust in Uzbekistan causes damage in certain areas in Tashkent, Fergana, and Samarkand regions. Another rapidly evolving disease on both durum and bread wheat is the tan spot disease (*Pyrenophora tritici repentis*) that is commonly found in fields that grow continuously spring and winter wheat. Tan spot was severe in most farmers' fields in Azerbaijan, Kyrgyzstan and Kazakhstan. Leaf rust was important in Azerbaijan and Uzbekistan in 2002. In Azerbaijan, common bunt was a problem in many wheat-growing areas and a high Fusarium infection was observed in Zaqatala Region. For wheat, it is rather common to find a field with more than three diseases at the same time.

Spring wheat disease survey in Northern Kazakhstan and Siberia was conducted under the GTZ-CIMMYT Seed Network Project from 3-12 August, 2003 in order to evaluate the distribution and severity of the main foliar diseases. The survey covered 3600 km following the route Karagandy-Astana- Pavlodar-Omsk (Russia) - Petropavlovsk- Kostanay- Karabalyk. The survey identified leaf rust and Septoria as main prevailing diseases during 2003. The survey team laid emphasis on Tan Spot (*Pyrenophora tritici-repentis*), which causes severe yield losses and has similar symptoms to those of Septoria. The leaf samples were collected from more than 70 sites for evaluation at the Catholic University of Leuven. A scientist from Kazakhstan is expected to go to Belgium for identification of disease pathotypes and reaction of Kazakh varieties.

## **2.9 Crop Diversification**

With the on-going land reforms and the emergence of small farm units, the role of crop diversification in a predominant monoculture system becomes rather important. Introduction of alternative crops will result in the diversification of agriculture and help smallholders to get additional income. Several potential alternative crops were studied during the last four years by ICARDA scientists, in partnership with NARS, under the ADB project. Some promising crops have been identified, such as chickpea, lentil, buckwheat, field peas, sunflower and safflower under rainfed farming and mung bean, soybean, common bean, cowpea, groundnut, sugar beet and maize under irrigated conditions. The current prices for these crops are more remunerative than for wheat and, therefore, alternative crops may find favor with farmers.

In Northern Kazakhstan, where rotation of spring wheat - summer fallow is a predominant practice, the introduction of alternative crops proved to be promising. During the four years of joint ICARDA research activities with the Scientific Production Center of Grain Farming under the ADB project, food legumes such as chickpea, lentil and dry pea proved to be more remunerative crops despite their relatively low yields (60-70%) than wheat. In addition, introduction of food legumes helps in improving soil fertility. Other promising crops for diversification are buckwheat and oat.

In drylands of Southern Kazakhstan and Kyrgyzstan, safflower has proved to be a reliable crop for crop diversification. The area under this crop has increased considerably (around 120 th. ha) in 2003 and there are good prospects for further increase.

Soybean is becoming quite attractive crop for diversification in irrigated farming in Southeastern Kazakhstan where area under it has increased to about 14 th. ha in 2003. Soybean is becoming popular in Kyrgyzstan as well. Sugar beet and maize followed by food legumes for irrigated conditions and field pea on drylands were also identified as economical crops in Kyrgyzstan. Common bean, which was not grown before, is now becoming a popular crop.

In wheat and cotton based mono-cropping systems, there are opportunities to introduce food legumes as double crops. In Tajikistan, double cropping is possible after winter wheat by growing cotton and

rice in south and buckwheat in north. In Uzbekistan, mungbean, soybean, common bean, maize are promising in the central region, whereas cotton is promising in the south. Cotton-wheat rotation is also proving quite promising in southern parts of Central Asia.

There are many new crops, which need attention both for research and development, such as, cowpea, safflower, rapeseed, berseem, etc. Accordingly, the new germplasm materials were introduced by PFU from different countries and the international centers for testing.

## 2.10 Human Resource Development

Following HRD activities were undertaken on various germplasm improvement activities:

Date and venue	Organization	Title of event	Participants
7 June, 2003 South Kazakhstan	ICARDA	Field workshop on "Crop diversification"	46 participants
10 – 13 June, 2003, Almaty, Kazakhstan	MoA, Kaz/ CIMMYT/ ICARDA/ GTZ/ USAID/WSU/FAO	The first Central Asian Wheat Conference	244 participants from 28 countries
1 – 5 July, 2003, Uzbekistan and Kazakhstan	ICARDA-CAC	The second traveling workshop on food legumes in Central Asia	11 scientists from 5 CA countries and Azerbaijan and Georgia
12 September, 2003, Tashkent, Uzbekistan	ICARDA/ CIMMYT/ GTZ	The second national workshop on "Strengthening wheat program in Uzbekistan"	65 representatives from Uzbekistan
11-12 May, 2004 Turkmenistan	ICARDA	In-country traveling workshop on "Breeding seed production and on farm experiments of winter wheat in Turkmenistan"	50 participants from Turkmenistan
14-16 May, 2004	ICARDA	Traveling workshop on "Establishing demonstration trials under on-farm conditions"	41 participants from Turkmenistan
17-23 May 2004 Tashkent, Uzbekistan	ICARDA/CIMMYT/ GTZ	Regional Training course on "Integrated Pest Management of Cereal and Legume Crops"	25 from Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan

## 3. SOIL AND WATER MANAGEMENT

### 3.1 IWMI Research on Water Management

Major activities of IWMI centred around the following three priority projects in the region:

#### 3.1.1 *Integrated Water Resources Management in Fergana Valley*

An SDC funded project on "Integrated Water Resources Management in the Fergana Valley" (IWRMFV), implemented jointly with the Scientific Information Center of the Interstate Commission on Water Coordination (SIC-ICWC) and local water management authorities, is being continued. A Second Annual Planning meeting of the IWRMFV project was held from 26-28 of January, 2004 in the Fergana province of Uzbekistan. The project is funded by Swiss Development Agency and activities cover Fergana Valley territory of the 3 states: Uzbekistan, Kyrgyzstan, and Tajikistan. Project started in 2002 and will continue until 2005 April. More than 150 people, water users, managers, policy makers, NGO representatives participated in the annual planning meeting. In 2003 SIC has employed 124 specialists of varying expertise and background and IWMI has provided 16 persons in total, 5 international and 11 local. The annual meeting discussed second annual progress report and approved yearly plan of operations for 2004.

### 3.1.2 Institutional Reforms and WUA Establishment in Karakalpakstan

In September, 2002, IWMI-CAC and ICARDA-CAC launched a core funded project on “Support to Institutional Reforms and WUA establishment in Karakalpakstan region of Uzbekistan”. The project is being carried out in collaboration with the Ministry of Agriculture and Water Management (MAWM) of Uzbekistan and local NARES. The main goal of the project is to improve the livelihoods of the people in the environmentally degraded, drought affected northern part of Uzbekistan through improvement of water management institutions.

A pilot WUA “Jambul” with an irrigated area of 1,419 ha and membership of 20 private farmers has been established. To assess the perception of water users on WUA, water distribution problems, cropping needs and markets, as well as existing irrigation and drainage infrastructure, project carried out several surveys including social survey, water impact survey, and agricultural survey. The project also conducted 3 workshops on WUA functions and management and 2 training workshops on steps of formation of WUA and role of social mobilization.

As a result, the water users started taking active part in organization and management of the irrigation system and making in-kind payment of membership fees. Through the project, irrigation and drainage infrastructure, water distribution, and land and water productivity have also been improved

### 3.1.3 “Best” Water Conservation Practices

The SIC-ICWC and IWMI have been working to identify best water conservation practices implemented by water users in the Amu-Darya and Syr-Darya rivers in order to bring positive change to water resources management in Central Asia. A number of field practices increasing water productivity were found. These included alternate furrow irrigation, use of shorter furrows, re-use of drainage water, improved field levelling, irrigation at night, and partial rehabilitation of irrigation-drainage infrastructure.

Knowledge dissemination and capacity building initiatives were:

- In November 2003, training workshops on “Legal issues, discussions and development of appropriate mechanisms of conflict resolution” were held in each of the pilot WUAs in the three countries. In all, more than 130 participants, including members of the WUA Dispute resolution and Auditing Commissions and others from the WUAs Councils and General Assemblies were trained.
- Social Mobilization and Institutional Development (SMID) activities are being continued at all pilot sites. During September-December 2003, 228 awareness-building meetings were organized with the participation of 3016 water users. These meetings were used by SMID teams to inform participants about water sector reforms, the purpose of WUA creation using hydrological boundaries and the new roles, rights and responsibilities of WUA employees and water users.
- Within the scope of IWRMFV project training workshop on “Improvement of water distribution in the pilot canals and role of Canal Water Committees (CWC)” was held 16-17 of March, 2004 in the Osh. The workshop attended by 30 participants from 3 pilot canals of the Fergana Valley: Aravan-Akbura in Osh province of Kyrgyzstan, South Fergana Canal in Andijan and Fergana provinces of Uzbekistan and Hojabakirgon in Sogd province of Tajikistan. Experts from SIC and IWMI trained participants on application of the Management Information Systems for water distribution, performance indicators and clarified terminology used in day to day operation. Workshop participants were informed on roles and responsibilities of the CWC on water management in the canal level.

- Within the scope of the IWRMFV project SMID of IWMI conducted 25 discussions involving a total of 60 people and 100 casual meetings with 130 people held in January, 2004. Water users and WUA staff from Tajikistan visited to WUAs in the Osh province of Kyrgyzstan. Training workshops for WUAs on Financial Management, Water distribution and Operation and Maintenance Planning has been conducted for 6 pilot WUAs in Uzbekistan (1), Kyrgyzstan (4) and Tajikistan (1).

### **3.2 ICARDA Program on Soil and Water Management**

During the period 2000-2003, the first phase of the ADB project “On-farm soil and water management for sustainable agricultural systems in Central Asia” was implemented by ICARDA seeking a six-month no-cost extension of the project up to June, 2003. Major results of the project are highlighted below:

#### *3.2.1 Soil Tillage*

- In rainfed semi-arid conditions of northern Kazakhstan, zero tillage during the fall proved to be more profitable and energy saving in last four years, provided adequate fertilizer was also applied. In rainfed conditions of southern Kazakhstan, conservation tillage was found to be more economical than traditional practice of deep ploughing. Technology including direct sowing with combine cultivator-drills was accepted by five individual farmers, who also decided to purchase this equipment from the north. In Turkmenistan, four years in a row, soil tillage for planting winter wheat at various depths (from 15-17 cm to 30-32 cm) did not reduce grain yields, whereas conservation tillage contributed to resource saving and allowed timely planting. However, continuous shallow tillage with disks at 12 cm contributed to soil compaction and lower crop yield. Therefore, reduced tillage has to be practiced in rotation with deep tillage once in three years.
- In Tashkent province of Uzbekistan, broadcasting of wheat under shallow cultivation compared to deep ploughing was found to be more beneficial. This practice has now been adopted on large scale in both Uzbekistan and Tajikistan.
- Under rainfed farming in Galla-Aral, Uzbekistan, no-tillage gave promising results for the first time.

#### *3.2.2 Crop Diversification*

The results of the project relating to crop diversification in CAC region have already been mentioned earlier in this report.

#### *3.2.3 Water Saving Technologies*

Improved furrow irrigation for raised bed planted wheat can significantly improve water use efficiency in south-eastern Kazakhstan. The sowing of winter wheat on raised beds at Merke site, Jambul province in 2003, revealed considerable advantage of this practice coupled with improved irrigation technology. Seed rate of winter wheat was reduced almost by half and the yield also increased significantly. Under cutback furrow irrigation, surface runoff reduced by 19-21% and saving of irrigation water applied was of the order of 15-20% as compared to traditional practice. In 2003, the farmer's income increased by 53% using both furrow irrigation and raised bed planted wheat as compared to traditional practice.

During 2000-2002, cutback alternate furrow irrigation was successfully adopted for cotton growing at Arys-Turkestan site. This year, improved alternate furrow irrigation was applied for maize intercropped with common bean.

Studies on improved furrow irrigation were continued on the farm of Kyrgyz Agricultural University. Highest income and water productivity was obtained from sugar beet. Common bean irrigated by alternate furrows had also high water productivity (2-3 times higher) than maize, soybean or wheat. Common bean also contributed to increased soil fertility.

Studies on sprinkler system at Kushman-ota farm, Uzbekistan revealed practically no significant difference in yield of winter wheat. However, irrigation water used was three times less compared to furrow irrigation. Sprinkler irrigation, therefore, increased water use efficiency by almost 25-30 percent.

Studies on water use efficiency in rice were also carried out at the Karakalpakstan Branch of the Rice Research Institute, Tashkent during 2002-2003. Cultivated rice area in this northwest part of Uzbekistan has reduced dramatically from 180,000 ha in 1980 to as much as 5,000 ha in 2001, mainly due to shortage of water. Also the crop yields were low (1.4 t/ha) and the water use was high (13,200 m<sup>3</sup>/ha of irrigation water). Intermittent irrigation technology was tested alongwith conjunctive use of surface and drainwater, and traditional flooding. Drainage water salinity was about 4.5-5.0 g/l compared to surface water having 1.2 g/l. Under intermittent irrigation, 16% less water was applied as compared to traditional practice, thus increasing water use efficiency. Even under drainwater use treatment, yield of rice was 4.0 t/ha as compared to 1.4 t/ha under traditional practice in dry years. Thus, intermittent irrigation could be adopted for rice cultivation in Karakalpakstan. Conjunctive use of surface and drainage water, however, reduced rice yield slightly. Yet, this technology can be used during dry years when very water availability is rather limited.

Joint ICARDA-IWMI research in Karakalpakstan was continued at a Djambul site in Keneges canal zone. IWMI worked on aspect related to Water Users Association, while ICARDA conducted on-farm irrigation and crop diversification research. Improved furrow irrigation technologies for sorghum production on saline soils (alternate furrow, discrete and cutback) were demonstrated to the farmers. The crop was grown on the highly saline soil. Only two irrigations were applied during July and August, respectively. Amount of water applied for irrigation was 1500 m<sup>3</sup>/ha and 1900 m<sup>3</sup>/ha under improved alternate furrow irrigation and traditional practice, respectively. The new technology increased yield of green mass by 5% and yield of grain by 10%.

During 2003, a few selected activities on soil and water management were initiated in the Caucasus, through core fund support by ICARDA. These were:

- In Azerbaijan, micro-sprinkler irrigation of high value crops will be one of the good options for increased water use efficiency on small farms. This technology was tested at the Ter-Ter site for irrigation of sugar beet. The yield increase of sugar beet was of the order of 13-31%, compared to furrow irrigation.
- In Armenia, development of a local remediation technology of solonetzic solonchak soil of Ararat valley was tested. Chemical treatments of these soils have become expensive for small farmers. Through this special device, alkaline and neutral salt solutions contained in the ground water are transformed to acidic, thus to be able to neutralize the saline soil. The saline ground water after remediation was used for soil leaching. The data obtained revealed that concentration of water-soluble salts after chemical remediation reduced significantly. Studies also showed that soil water permeability after remediation improved considerably. These studies are being further reconfirmed, before large scale adoption of this new approach.
- In Georgia, studies were carried out on soil conservation tillage, double cropping and soil fertility management. Conservation tillage for winter wheat proved to be very efficient to

control soil erosion and water conservation, which also resulted in increased grain yield. Several legume forages were tried after the harvest of winter wheat, producing additional 25 t/ha of forage. Common beans, inter-cropped with maize, reduced maize grain yield by 0.8 t/ha but provided additional 2.0 t/ha of common beans instead. Most economical grain yield was obtained with the application of 90 kg/ha of each NPK.

### 3.2.4 New ADB project

ADB has recently approved a new project entitled “Improving Rural Livelihoods through Efficient On-Farm Water and Soil Fertility Management in Central Asia”, to be implemented by ICARDA in five countries of Central Asia as well as Azerbaijan.

An Inception workshop of the project was held in Tashkent from 19-20 February, 2004. In all, more than 60 participants attended the workshop, including Heads of NARS and leading scientists from all Central Asian countries and Azerbaijan, representatives of ADB, SDC, USAID, GTZ, and some NGOs, scientists from ICARDA Headquarters and CAC Regional Office as well as IWMI. In pursuance of the decision of Steering Committee, the National Coordination and Planning Meetings were also held in all the six countries to finalize the technical work plans during March –April, 2004.

### 3.5 Human Resource Development

Following HRD activities were undertaken by ICARDA, in partnership with JICA and ICBA, in the area of soil and water management during the year under report:

Date and venue	Organization	Title of the event	Number of participants
5 May –12 June, 2003 Aleppo, Syria	ICARDA-JICA	Training course on “Management of Water Resources and Improvement of Water Use Efficiency in the Dry Areas”	Four scientists from Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan
12-21 May, 2003 Tashkent, Uzbekistan	ICBA-ICARDA	Training workshop on “Bio-saline Agriculture and Sustainable Production Systems”	Twenty-seven scientists from Azerbaijan (4), Kazakhstan (4), Kyrgyzstan (4), Tajikistan (6), Turkmenistan (4), Uzbekistan (5)
5 May – 10 June, 2004 Aleppo, Syria	ICARDA-JICA	Training course on “Management of Water Resources and Improvement of Water Use Efficiency in the Dry Areas”	Four scientists, including from Kazakhstan (1), Kyrgyzstan (1) and Uzbekistan (2)

## 4. FEED AND LIVESTOCK MANAGEMENT

### 4.1 IFAD Project on Integrated Feed and Livestock Management

This project was implemented by ICARDA in collaboration with NARS of the Central Asia, USAID-GL-CRSP and ILRI during 1999 – 2002. In 2003, some activities continued on a no-cost extension basis. Results of the three major components of the project are briefly summarized below:

#### 4.1.1 Socio-economic Studies

- Big scale farms (various types of cooperatives) are mainly involved in the production of strategic crops often with no livestock production. Emerging individual farms also do not play important role in livestock production as crops provide them more benefits. Rural households are, therefore, the major livestock producers supplying most livestock products to the markets.

- The main problem for all types of livestock producers is the lack of forage, especially during the winter period.
- Small-scale farms and households have relatively poor or no access to remote rangelands, which in real sense is constraining effective livestock production and causing social conflicts among different farming groups.
- Local markets are the main source of income to the producers compared with selling products to processing companies, as before. In countries with more liberal policies like Kazakhstan, private companies are increasing their share in processing of livestock products. Among all types of products, live animals generate the largest share of producers' income. Fresh milk is being sold in cities and towns mostly by the milk women supplying various dairy products directly to the customers' at their doorstep.

#### 4.1.2 Range Management

- Appropriate options for the rational utilization of rangelands were developed through organized mobile flocks moved for grazing to the remote ranges in Kazakhstan.
- Rotational grazing system was introduced by dividing the village rangeland into two equal parts and using alternative grazing practice on each of these. As a result, every year one part could be in the "resting" stage either in spring or in autumn.
- The utilization of drain water in Turkmenistan confirmed production of halophytes in saline soils.

#### 4.1.3 Livestock Management

To improve the milk yield of local sheep for increased farmers' income in Boykozon Farm, Uzbekistan, ewes of non-indigenous semi-fine wool breed were inseminated during October-November, 2002, using the semen of dairy East Friesian and Lacaune breeds, received from the University of Wisconsin, USA. Out of 557 ewes inseminated using a laparoscopic method, 306 got pregnant (55% success). By the end of lambing season (mid-April 2003), 376 lambs were born. All the lambs are being monitored and records on their growth and development are being generated on monthly basis. Average live body weight of new crossbred sheep at the age of one year was about 35 kg (30-42), which is higher by almost 8 kg than those of the control group. It is expected to have lambing from these crossbred sheep by early spring 2005, though there had been some mortality due to harsh weather conditions.

## 4.2 ILRI Initiatives

During 2002-2003, ILRI was involved in a number of activities in the CAC region. The first was to publish the study completed in 2001-2002 on 'The potential for increasing producers' income from wool, fibre and pelts in Central Asia', which was initiated by ILRI and led by the Macaulay Institute, UK, with funding from DFID. Based on its findings a proposal for the in-depth analysis of wool and pelt marketing was developed and a funding agency is being sought.

The second, supported by a grant from the CGIAR System-wide Livestock Programme (SLP) and led by ICARDA in collaboration with ILRI was on forage production aspects in the Caucasus to identify and target technologies for feed production and utilization in crop-livestock systems including rangelands as part of a larger joint project on "Increasing feed resources and efficiency of utilization in Armenia, Georgia and Azerbaijan".

The third, also supported by the SLP and led by ILRI in collaboration with ICARDA, was on genetic characterization of main small ruminant breeds in 7 countries in the CAC region. Based on information generated, a publication is being contemplated in the near future.

The fourth activity was to participate with FAO-LEAD in implementing the Russian Language Platform to build up in the CIS countries and Mongolia a network of institutions and researchers interested on livestock and environment related issues and, to set up the foundations for the development of a Livestock, Environment and Development Russian Language Platform. The first phase of the platform was implemented in 2003 with funding from the Swiss Development Cooperation. PFU also extended needed partnership in this initiative.

## **5. CONSERVATION OF GENETIC RESOURCES**

The CAC region is the center of origin of many economically important crop species. It represents very rich genetic diversity of crops with many landraces and their wild relatives. In all, more than 8,100 plant species are recorded in the region, of which 890 are endemic. Here exists one of the world's best collections of fruits, nuts, and melons. Due to financial constraints and breaking of links with the VIR, the leading Russian institution on PGR, the support for genetic resource activities got weakened. Hence, efforts on PGR activities needed to be strengthened. Specific activities undertaken recently by IPGRI, ICARDA, CIMMYT and other centers are reported here:

### **5.1 Joint PFU-ICARDA-IPGRI Initiatives**

The Central Asian and Trans-Caucasian Network (CATCN) on PGR, involving all eight countries, is facilitated by IPGRI. It consists of eight working group on different crops, including medicinal plants and forest species. Of these, five working group are served by IPGRI, whereas ICARDA is facilitating the work of three groups i.e. cereals, food legumes and forages and pasture species. The Steering Committee of CATCN has been meeting regularly to review the progress and finalize the work plans.

Through the joint efforts of the Ministry of Agriculture and Water Management of Uzbekistan, USDA, ICARDA and IPGRI, Uzbek Gene Bank has been renovated and made fully functional. ICARDA provided technical backstopping to Uzbek Research Institute of Plant Industry (UzRIPI) in terms of renovation, designing, and purchasing different equipment. ICARDA also supporting UzRIPI to procure 11,000 plastic containers for seed storage, for fixing shelves in the storage room and an additional generator for cooling system and organized travel of leading scientists and building engineer to India. IPGRI has provided a seed dehumidifier and about 1,000 plastic containers.

The success story of the renovation of the Uzbek Gene Bank helped catalyze the policy makers to improve the other germplasm storage facilities. Thus, by the recent Decree of the President of Uzbekistan, it has been decided to start the renovation of three more germplasm storage facilities at the Uzbek Cotton Breeding Research Institute, the Research Institute of Genetics and Experimental Biology of Plants and the Andijan Research Institute of Grain and Legume Crops. ICARDA has again been requested to provide required technical backstopping.

Upon the requests from Kyrgyz and Georgian NARS leaders, PFU-ICARDA-IPGRI have provided need based support for upgrading the storage facility of the genebanks at the Kyrgyz PGR Center and Georgian Research Institute of Crop Husbandry (GRICH), respectively. These facilities are being renovated and now made functional with procurement of controlled temperature facility and the needed equipment.

Also, by a recent order of the President of Kazakhstan, it has been decided to start the construction of a National Plant and Animal Genetic Resources Center with modern Gene Bank facilities near Almaty. Specialists on PGR from IPGRI and ICARDA are already involved for the technical backstopping being on the Organizing Committee formed by the Government.

## **5.2 IPGRI Activities**

During 2003/2004, major activities of IPGRI in the region were organized through the following projects and activities:

### *5.2.1 New Project on in situ conservation*

New project on “*In situ* Conservation of Crop Wild Relatives through Enhanced Information Management and Field Application” is launched in 2004 by IPGRI with support of UNEP-GEF. Armenia and Uzbekistan along with Bolivia, Madagascar, Sri Lanka are working together to develop and implement rational, cost effective approaches to conserve crop wild relatives. The objective of the project is to improve global food security through effective conservation and increased use of priority crop wild relatives and enhanced capacity to use information to support their conservation and sustainable utilization.

### *5.2.2 National Information Sharing Mechanism*

A project on “Establishment of a national information sharing mechanism on the implementation of the Global Plan of Action on plant genetic resources for food and agriculture in Uzbekistan” has been initiated by FAO and IPGRI in 2004. The project is aimed at improving the ability of the country to make decisions about plant genetic resources including establishing objectives, defining needs and allocating resources, improve the quality of information about plant genetic resources status and dynamics, monitor changes in its plant genetic resources over time, enhance national capacity to meet international reporting obligations as Global Plan of Action (GPA), second Report on the State of the World’s PGRFA, CBD, etc. Uzbek Institute of Genetics and Plant Experimental Biology (UzIGPEB) will be the National Focal point for project implementation

### *5.2.3 Forest Genetic Resources*

Fourth meeting of Regional Working Group on Forest GR was held on 2003 in Bishkek, Kyrgyzstan and hosted by the Institute of Forest and Nut Industry of National Academy of Sciences. The main objectives of the meeting were to review the progress made by the Group in 2000-2002, discussion of further steps in collaborative activity and development of the work plan of the Group for 2003-2005. The concept note of the project proposal on “Conservation of indigenous forest species and their use in combating land degradation and improving living conditions in mountainous area in CAC countries” was discussed.

### *5.2.4 Fruit Genetic Resources*

Implementation of PDF B phase of the UNEP-GEF Project on “*In Situ/On-Farm* Conservation and Use of Agrobiodiversity (Horticultural Crops and Wild Fruit Species) in Central Asia” was started in August 2002 and will be completed in June 2004 with the purpose to develop the full project proposal for five years. Complementary conservation and use strategies for fruit and nut trees in Central Asia are being developed with the objective to support national programmes for the scientific and technical inputs concerning conservation and utilization of temperate species of fruit and nut trees which originated in the region. A booklet on fruit and nut conservation (*in situ* and *ex situ*) and use in CA is being developed.

### 5.2.5 Medicinal Plants

A catalogue on medicinal plants in CAC region has been developed. Medicinal plants are being listed by Scientific, Russian, Ethnic and English names in the catalogue. Concept note of a regional project proposal on enhanced in situ/on farm management of medicinal plants towards improvement of people and environment health in CAC” is drafted.

LoA is signed with Samarkand State University to support one MSc degree research in Uzbekistan on sea buckthorn (*Hippophae rhamnoides*), a multi-purpose medicinal/food tree species strategic in marginal lands of Central Asia, which is facing genetic erosion.

### 5.2.6 Socio-economic studies

The project ‘Strengthening community institutions to support the conservation and use of plant genetic resources in Uzbekistan and Turkmenistan’ was initiated in 2002 by IPGRI in collaboration with its sister center IFPRI under the support of System-wide Program on Collective Action and Property Rights (CAPRI). The project seeks to understand how changes in land tenure and rural institutions have affected conservation and use of plant genetic resources in Turkmenistan and Uzbekistan. Field survey were conducted in Rishtan and Kuva districts in Fergana Province and Urgut and Bulungur districts in Samarkand Province in 2003-2004. Eight hundred households in 40 villages were surveyed and relevant socio-economic, cadastral and ecological data at household, village, district and province levels were collected. Group surveys were also conducted in 27 villages and data on fruit crops and grapes diversity, historical events which had a significant impact on biodiversity, traditional methods of use of genetic resources and production technology etc. was gathered. Recommendations to policy makers, national and local experts on strengthening conservation of indigenous fruit crops diversity and promoting its sustainable use will be developed based on the outputs of these studies.

## 5.3 PGR Initiatives by ICARDA

ICARDA has been playing important role to strengthen PGR activities on cereals and legumes, mainly under the ACIAR project for CAC region.

Following collection missions were organized in the region during the last one year:

i) In 2003, two collection missions were organized. The first collection mission was organized in Armenia from 10-30 July in collaboration with the Ministry of Agriculture. Scientists from ICARDA, Armenian Research Institutes and VIR-Russia attended the collection mission. The participants covered 2000 km and collected 364 important accessions of cereals, food legumes, fodder crops and their wild relatives.

ii) Second collection mission was organized by ICARDA in Pamir Mountain, Tajikistan from 11-30 August, in collaboration with Tajik Academy of Agricultural Sciences (TAAS). Eight scientists from ICARDA, CIMMYT, Uzbekistan, TAAS and Agricultural Research Institutes of Tajikistan participated in the collection mission. 318 valuable accessions of cereals, food legumes, fodder crops and their wild relatives were collected.

Hence, during 2003, 682 accessions have been added to earlier collections of 1782 accessions. The collected germplasm is now kept by the host country and stored “in-trust” in the ICARDA’s gene bank, providing safety duplication.

Other activities undertaken by ICARDA are briefly mentioned here:

The web site of the CGIAR Collaborative Program for CAC ([www.icarda.cgiar.org/cac/index.htm](http://www.icarda.cgiar.org/cac/index.htm)) is available on the Internet since September, 2001. In this web site, PGR webpage was established: [www.cac-biodiversity.org](http://www.cac-biodiversity.org) This webpage describes some of the plant genetic resources initiatives in the region, and highlights an ICARDA-led initiative to develop genetic resources units in each of the eight CAC countries.

A Regional PGR Coordination Meeting for Central Asia and the Caucasus was held from 8-11 December, 2003 in Tashkent. The meeting was attended by 29 representatives of PGR Units from eight CAC countries as well as Genetic Resources scientists from ICARDA, Australia and CGIAR-PFU. The participants agreed to complete the inventory of ICARDA's mandate crops by the end of April, 2004. Also PGR Web-page in present is functional.

The senior documentation specialist from ICARDA-GRU visited Azerbaijan, Armenia and Georgia in July-August 2003 and conducted training on the last updated version of ICARDA/CAC database for the members of PGR Units and other specialists from the research institutions. Thereafter, 2 documentation specialists from Armenia and Georgia visited Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan to conduct the same training. Later, the documentation specialist from Uzbekistan visited Turkmenistan in September, 2003 and Tajikistan in March, 2004 to conduct similar training.

The Gene Bank specialist from ICARDA visited Azerbaijan in April, 2004 to assist the National Institute on Genetic Resources and to advise on germplasm conservation facilities.

#### 5.4 Human Resource Development

Following HRD activities were undertaken by IPGRI and ICARDA on genetic resource conservation and management:

Date and venue	Organization	Title of event	Participants
Institute of Plant Breeding, University of Sydney, Australia, 2004	IPGRI (Vavilov-Frankel Fellowship)	Rust ( <i>Puccinia spp.</i> ) resistance and associated molecular diversity of endemic Georgian <i>Triticum timopheevii</i> plant genetic resources"	Ms. Tamar Jinjikhadze, PGR Centre, Institute of Farming, Georgian Academy of Agriculture Sciences
May, 2003, Almaty, Kazakhstan (Institute of Economics of Agro industrial complex and Rural Areas Development)	IPGRI	Training Course on 'Participatory Approach in Management of Fruit Genetic Resources'	Representatives of Tajikistan, Turkmenistan, Kazakhstan, Kyrgyzstan and Uzbekistan
June, 2003, Khodjand, Tajikistan (R&P Centre 'Bogparvar')	IPGRI	Training Course on 'Assessment of Diversity Level and Distribution of Apricot Genetic Resources'	Representatives of Tajikistan, Turkmenistan, Kazakhstan, Kyrgyzstan and Uzbekistan
February 2004, Aleppo, Syria	ICARDA	Training on "Data Documentation"	One scientist from Azerbaijan

## **6. STRENGTHENING THE NARS**

Most of the training activities have already been mentioned in this report under the respective themes. Below are the summarized data on cross-sectional human capacity building:

All centers have made concerted efforts towards capacity building. It includes various trainings, study tours, participation in international, regional and national scientific meetings and workshops, supply of computers and other research equipment, etc. Since June 2003, the CAC Program has arranged 11 short and long term training courses with participation of 87 scientists, 4 study visits involving 6 scientists, 14 regional and national workshops involving 436 scientists, officials and farmers, and 3 International Conferences with participation of 237 scientists. A total of 766 persons from the CAC countries got benefited from human resource development activities during the year under report.

### **6.1 IFPRI Initiatives**

IFPRI conducted research on addressing poverty and food security in the Central Asian countries. Based on the secondary sources of existing available data for countries such as Kyrgyzstan, Tajikistan, and Kazakhstan, a comprehensive report on "Poverty in Central Asia: Policy Reforms and Options" was prepared. The paper is currently being reviewed for further update. Drs. Suresh Babu and Valerie Rhoe participated in the International Association of Agricultural Economists conference in Durban on 18-22 August, 2003, presenting a paper entitled "Economic Reforms and Poverty Alleviation in Central Asia: Case Study of Tajikistan." IFPRI also plans to develop a comprehensive approach to policy analysis and capacity strengthening in the Central Asia region.

### **6.2 ISNAR Activities**

Drs. Turgul Temel and Ajit Maru from ISNAR worked with Georgian Academy of Agricultural Sciences (GAAS) to prepare a project proposal on the Information Communication Technology infrastructure and use in agricultural research in Georgia likely to be funded by FAO. The objective of the project is to assess the needs of national agriculture research institutions and their partners for innovative and efficient information and communication systems in Georgia. ISNAR-FAO report on ICT use in Georgia has been published.

Transitional arrangements for the ISNAR program to be relocated at IFPRI are moving steadily forward, and ISNAR's Board of Trustees had fixed March 31, 2004 as the deadline for ending ISNAR operations in The Hague. From 1 April, 2004, ISNAR Program as one of the IFPRI's division, will be operating from Addis Ababa, Ethiopia. The detailed plan and regional strategies, including that for the CAC region, will be developed in consultation with the stakeholders, after the new Director assumes his duties.

### **6.3 Conferences/ Workshops/ Meetings**

An International Conference on Scientific Support to the State Agricultural Program in the Republic of Kazakhstan" was held on 24-25 April, 2003 in Astana. The Conference was organized by the Ministry of Agriculture of Kazakhstan and attended by around 200 scientists and officials, including those from different countries of Central Asia, Russia and also the international organizations. Head, PFU made a presentation in the Opening Session regarding the CGIAR Program in CAC.

The 37<sup>th</sup> ICARDA Board of Trustees Meeting was held in Tashkent from 19-23 May, 2003 to emphasize the importance being attached by ICARDA to the Central Asian and Caucasian countries. The meeting was facilitated by PFU-ICARDA Regional office. On 21 May 2003, the BOT members met with HE Dr. Nosirjon Yusupov, Minister of Agriculture, Uzbekistan, who was very appreciative of ICARDA's role in the region. During the Field Days, organized on 19 and 23 May, the members

of ICARDA BOT visited different experimental sites to see some of the activities being undertaken jointly by ICARDA scientists and the researchers working in different Uzbek Institutes. They also had an opportunity to interact with the scientists and farmers involved in different collaborative activities.

ICARDA participated in the 13<sup>th</sup> ECO meeting of the Council of Ministers held in Bishkek, Kyrgyzstan on 11 June, 2003. The meeting was attended by the Ministers of Foreign Affairs of Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkey and Uzbekistan. During the meeting, various issues of inter-regional cooperation were discussed. This organization has completed 10 years last year.

IPGRI organized the 2<sup>nd</sup> National Workshop in all the five countries of Central Asia from 30 July to 3 September, 2003 under the PDF B phase of the UNEP-GEF project on “*In Situ*/On Farm Conservation of Agricultural Biodiversity in Central Asia” with a purpose to develop specific country-wise components for the full project proposal.

A special meeting on seed harmonization in the CAC region was held on 25 September 2003 in the Ministry of Agriculture of Armenia, Yerevan. Dr. M. Larinde, FAO, Rome, Mr. M. Lemonius, FAO, Consultant, Dr. A. Van Gastel, Head of Seed Unit, ICARDA, Dr. Raj Paroda, Head of CGIAR-PFU, Dr. M. Suleimenov, ICARDA-CAC and Dr. B. Djumakhanov, ICARDA-CAC attended. It was decided to prepare a proposal for regional TCP on seed harmonization and to hold a regional conference on seed technology and development for CAC in Tashkent during 2005.

The seventh ICARDA-CAC Regional Coordination meeting was held in Yerevan, Armenia from 26-28 September, 2003. The meeting was hosted by the Ministry of Agriculture of the Republic of Armenia. In all, 45 participants attended the meeting, including the Heads of seven NARS from the CAC region, ICARDA scientists, representatives of other international and donor organizations as well as NGOs. As an outcome of the meeting, all the participants agreed that there is a need for strengthening the activities on germplasm enhancement especially emphasizing the importance of the seed production and technology transfer components. It was also agreed to develop two separate proposals on Mountain Agriculture for Kyrgyzstan and Tajikistan in Central Asia and Armenia and Georgia in the Caucasus.

A Regional Conference on Policies and Technology Options for Livestock Development in Central Asia and the Caucasus was held in Tashkent from 4-5 October 2003. In all, 30 participants attended the conference, including representatives of the Ministries of Agriculture from CAC countries, National Coordinators, principal investigators and senior scientists from ICARDA and NARS as well as representatives of IFAD, the World Bank and the European Union.

First Steering Committee meeting on the project “Improving Rural Livelihoods through Efficient On-farm Water and Soil Fertility Management in Central Asia” was held in Tashkent on 20 February, 2004 with participation of NARS Heads and national team leaders from all the six countries involved, as well as ADB representatives and ICARDA scientists. During the meeting, different issues relating to project management were finalized, including the workplan and budget for 2004. It was also decided to hold the National level planning meetings during March-April, 2004.

An International Research and Production Conference on Land and Agrarian Reform was held in Bishkek, Kyrgyzstan from 12-13 March, 2004. In all, more than 1,200 participants, including policy makers, agricultural scientists, NGOs, farmers and international organizations, attended the conference. Head, PFU gave an overview on CGIAR activities in Kyrgyzstan and congratulated the country for having moved faster towards privatization of agriculture compared to other countries of Central Asia. He dwelt upon major activities undertaken by ICARDA and other CG Centers of the

Consortium in the Kyrgyz Republic, including germplasm improvement, genetic resource conservation, natural resource management and human capacity building. He also shared with the participants some success stories of Green Revolution and co-operative movement in India and emphasized the need for policy support to agricultural research.

The Second Yellow Rust Conference was held at the National Agricultural Research Center (NARC) in Islamabad, Pakistan from 22-26 March, 2004. More than a hundred participants from 18 countries attended the conference, including 6 scientists from CAC. The next conference is planned to be held in Tashkent in 2007.

A National Wheat Conference of Uzbekistan was organized at the Tashkent Agrarian University from 17-18 May, 2004, in which about 120 scientists participated to review wheat research and development efforts at the national level. It was also held jointly by the Ministry of Agriculture and Water Management, ICARDA, CIMMYT and GTZ with participation of international scientists.

#### **6.4 Regional Trainings**

A training course on “Participatory approach in plant genetic resources management” was organized by IPGRI from 16-18 July 2003 at the Kazakh research Institute of Agro-industrial Economy and Development of Rural Areas, Almaty, Kazakhstan, within the UNEP-GEF (PDF B Phase) project on “*In Situ/On Farm Conservation of Agricultural Biodiversity in Central Asia*”. The training course was attended by the representatives from all the five Central Asian countries.

An English training course of 3.5 months was organized by the PFU and ICARDA from 15 November, 2003 – 27 March, 2004 in Tashkent, Uzbekistan. In all, 23 participants from different countries attended the course, including Uzbekistan (17), Kazakhstan (3), Georgia (2), and Tajikistan (1).

#### **6.5 Strengthening of Regional Forum**

##### *6.5.1 CACAARI*

In accordance with the decision of Executive Committee, duly endorsed by the Steering Committee, PFU provided facilitation role to the CAC Regional Forum – CACAARI in order to strengthen partnership among NARS. Following are the important initiatives in this regard:

PFU-CGIAR provided logistic support on behalf of GFAR for seven people including two farmers to participate in the Second Triennial GFAR Conference, which was held in Dakar, Senegal from 22-24 May 2003.

The meeting of the CAC Regional Forum was held in Tashkent on 7 June, 2003 and attended by all the NARS leaders and their representatives. The participants adopted the draft “Rules and Guidelines” and also the logo of the CAC Regional Forum. Besides, the elections for the new Executive Committee were held. Dr. Sherali Nurmatov from Uzbekistan was elected as Chairman and Dr. Asanbek Ajibekov from Kyrgyzstan and Dr. Samwel Avetisyan from Armenia were elected as Executive Secretaries for Central Asia and the Caucasus, respectively. It was also renamed as CAC Association of Agricultural Research Institutions (CACAARI).

Next meeting of the CAC Regional Forum was held on 29 September, 2003 in Yerevan, Armenia. The Heads of seven NARS and Head, PFU-CGIAR for CAC attended the meeting. Dr. Sherali Nurmatov, Chairman, CAC Regional Forum made a presentation on the progress achieved by CACAARI since its last meeting. He also briefed the participants on future activities to be

undertaken, such as organizing Regional Agricultural Information System (RAIS) Workshop in Tashkent and strengthening the CAC Regional Forum Secretariat.

A Regional Agricultural Information System (RAIS) Workshop for Central Asia and the Caucasus was held in Tashkent, Uzbekistan from 27-28 January, 2004. The workshop was the first formal event organized by the recently established CAC Association of Agricultural Research Institutions (CACAARI). In all, 21 participants attended the workshop, including representatives of NARS, GFAR, Regional Fora (AARINENA and APAARI) and ICARDA. The delegates endorsed the following: (i) to establish Regional Agricultural Information System in the CAC Region; (ii) there is a need for a multistakeholder involvement to achieve effectively the national and regional information system in the area of ARD; (iii) to appoint national focal points in charge of improved articulation of the national web information resources, consistently with the requirements of the RAIS and its gateway function; and (iv) each NARS to strengthen Agroweb as a relevant initiative enabling the management of national information resources in ARD and gateway function from the regional level facilitating the access to national resources.

Dr. Sherali Nurmatov, Chairman of the CAC Association of Agricultural research Institutions (CACAARI) and Deputy Minister of Agriculture and Water Management, Uzbekistan and Dr. A. Ajibekov, Executive Secretary CACAARI, Director General, Center of Agrarian Sciences and Consulting Services, Kyrgyzstan visited Nairobi, Kenya from 25-27 October, 2003 to attend the 13th Global Forum for Agricultural Research (GFAR) Steering Committee. On behalf of GFAR, PFU facilitated their visit, including participation of Dr. Zakir Khalikulov to overcome the language barrier.

Dr. Samvel Avetysyan, First Deputy Minister of Agriculture, Armenia and Executive Secretary of CACAARI for the Caucasus Region, Dr. Asanbek Ajibekov, Director General, Kyrgyz Center of Agrarian Sciences and Consulting Services and Executive Secretary of CACAARI for Central Asia Region and Dr. Zakir Khalikulov, CGIAR-PFU participated in GFAR Retreat Meeting held from 1-3 February, 2004 in Florence, Italy. PFU extended logistic support for their participation on behalf of GFAR.

An Inter-regional Research Network on cotton for Central Asia and North Africa (INCANA) was jointly established by three Regional Fora, AARINENA, APAARI and CACAARI, with support of ICARDA and GFAR during October, 2002. The second meeting of this network will be held in Tashkent from 6-8 September, 2004 and will be hosted by CACAARI, for which required logistic support is being extended by PFU.

#### 6.5.2 SPA

As a first positive step towards collaboration between ICARDA and Global Mechanism (GM), the Regional Office in Tashkent is now hosting a Regional Management Environmental Consultant, who coordinates the GM's work in Central Asia and facilitates the effective implementation of the UNCCD in the region. The "Strategic Partnership Agreement" for GM initiatives in the Central Asian countries was signed with ICARDA on 30 June, 2003 in Tashkent during the sub-regional Partnership Building Forum for Central Asian Republics: Confronting Land Degradation and Poverty through Enhanced UNCCD Implementation. ICARDA Regional office provided logistic support to this important meeting.

#### 6.5.3 CACILM

ICARDA represented by Dr. Richard Thomas, Director, NRM Program, participated in the Workshop on Elaboration of the Central Asian Countries Initiative for Land Management

(CACILM), held in Almaty, Kazakhstan on 21-22 February, 2004. Being an outgrowth of the ongoing process to strengthen implementation of the UNCCD in Central Asia, CACILM is to create a framework for centralizing the efforts of Governments, national research institutions, international organizations, donor agencies and civil societies to establish the basis for sustainable agricultural, rangeland and forestry systems in the region. ICARDA is expected to play an important role as neutral organization in the monitoring system.

## **6.6 Important Visitors**

Dr. Murthi Anishetty, Senior Officer, Seed and Plant Genetic Resources Service, FAO visited Uzbekistan and Kyrgyzstan from 14-20 July, 2003 to oversee the progress made under the PGR activities in these countries and discuss possible collaboration between FAO and CAC Region. He also explored the possibility of establishing a national information sharing mechanism on the implementation of the Global Plan of Action on plant genetic resources for food and agriculture.

Dr. M. Nossier, Country Project officer from FAO Regional Office in Cairo, Egypt visited Kazakhstan from 18-20 August 2003 to review the ongoing FAO TCP project on conservation agriculture implemented jointly by the Ministry of Agriculture, Kazakhstan and CIMMYT.

Dr. Michael A. Larinde, AGPS, FAO visited Uzbekistan from 14-19 September 2003 to prepare a Technical Cooperation Program on "Improvement of cereal, leguminous, oil and forage crops seed production in Uzbekistan". During his visit, Dr. Larinde had several meetings with policy makers and seed production specialists.

IFAD Review team, Drs. Mark Rweyemamu and Chulun Togtohyn visited Kazakhstan, Kyrgyzstan and Uzbekistan from 26 September to 6 October, 2003 to undertake a review of the activities and achievements of IFL-CA project. The team was accompanied by Drs. Luis Iniguez and Aden Aw-Hassan from ICARDA and Dr. Mekhlis Suleimenov and Ms. Madina Musaeva from ICARDA Regional Office in Tashkent. In its mission report, work done under IFAD project has been highly appreciated and the Review team has recommended the second phase of the project.

Dr. Muhammad Tusneem, Director General, East and Central Asia Department, Asian Development Bank (ADB) visited ICARDA-CAC office on 13 November, 2003 and was briefed on the achievements under the 1<sup>st</sup> phase of ADB project. Other issues discussed during the meeting included the possibility of linkages with ADB development oriented projects and funding of the Mountain Agriculture project for Kyrgyzstan and Tajikistan, for which Dr. Tusneem was quite supportive.

ADB Mission headed by Dr. Katsuji Matsunami, Director, Agriculture, Environment and Natural Resources Division, ADB visited ICARDA-CAC Regional Office in Tashkent on 11 February, 2004. The Mission was undertaken on the Central Asian Countries Initiative for Land Management (CACILM), which is an outgrowth of the ongoing process to strengthen implementation of the UNCCD in Central Asia. The members of the mission had an interesting discussion with the scientists of the ICARDA Regional Office concerning ICARDA's role in the CACILM Partnership. The possibilities of ADB's support for the Mountain Agriculture project in Central Asia was also discussed.

## **6.7 Initiatives on Resource Generation**

A new project on "Improving Rural Livelihoods through Efficient On-Farm Water and Soil Fertility Management in Central Asia" was approved by ADB in November, 2003. The project, of which the

total budget is US \$ 1.0 million, is being implemented by ICARDA in the five Central Asian countries and Azerbaijan.

A full-size project on “In situ Conservation of Crop Wild Relatives through Enhanced Information Management and Field Application”, submitted by IPGRI to UNEP-GEF has approved for implementation in five countries, including Armenia and Uzbekistan from the region.

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A proposal of the full-size project on “In-situ/on farm conservation of Agrobiodiversity (Horticultural Crops and Wild Fruit Species) in Central Asia” is being submitted by IPGRI to UNEP-GEF. The Project is to be carried out in all the five countries of Central Asia, with proposed outlay of US \$ 5.7 million.

A second phase project proposal on “Genetic resource Conservation, Documentation and Utilization in Central Asia and the Caucasus” has been submitted to ACIAR by ICARDA and approval is being awaited. The proposed budget of the project is US \$ 420,000 for a period of three years.

A Technical Cooperation Program (TCP) on “Sustainable agriculture practices in the drought-affected region of Karakalpakstan” was approved by FAO and signed by the Government of Uzbekistan. The two-year project with its total budget of US \$ 400,000 will be executed by the Ministry of Agriculture and Water Management of Uzbekistan, with on-site technical guidance and support to be provided by ICARDA.

A TCP on “Strengthening seed supply in CAC countries” was submitted to FAO by the CGIAR Program Facilitation Unit (PFU) in Tashkent through ICARDA. The duration of TCP is for two years and the project outlay is around US \$ 370,100.

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A concept note of the project “Breaking the poverty-land degradation cycle for mountain people in Central Asia”, submitted by ICARDA to ADB for funding under the 9<sup>th</sup> RETA, was selected for full proposal development. The project is to be implemented in Kyrgyzstan and Tajikistan during three years and the proposed budget is US \$ 900,000.

Another project proposal on Mountain Agriculture entitled “Breaking the poverty-land degradation cycle for mountain communities in the Caucasus” is being submitted by ICARDA to UNEP-GEF as a Medium-sized project (MSP). The project is to be implemented in Armenia and Georgia and the estimated budget is US \$ 895,000 for a period of three years.

A second phase project proposal entitled “Community Action in Integrated and Market Oriented Feed-Livestock Production in the Caucasus and Central Asia” was submitted to IFAD to be funded under the Technical Assistance Grant (TAG). The three-year project with the total budget of US \$ 1.2 million is expected to cover the Caucasus in addition to Central Asian countries.

A concept note on “Demonstrating Options for Rehabilitating Saline Soils in the Aral Sea Basin” developed jointly by IWMI and ICARDA was submitted to ADB for funding under the 9<sup>th</sup> RETA. The concept note has also received clearance for submission of full proposal. The estimated budget is US \$ 1.2 for three years.

A concept note on “Sustainable livestock and rangeland biodiversity management to combat natural resource degradation and increase rural community livelihoods in Kazakhstan, Turkmenistan and Uzbekistan”, developed by ICARDA is being submitted to GEF through the World Bank as MSP with an estimated budget of US \$ 900,000 for a period of three years.

The Global Crop Diversity Trust (GCDT) is proposing to support *ex situ* conservation of valuable genetic resources in CAC region as one of its priorities. A project proposal, in this context, is being prepared by ICARDA for consideration by the Executive Board of the Trust.

## **6.8 Inter-Center Partnership Strengthened**

The Inter-Center Partnership has been further strengthened by having new initiatives, such as varietal improvement of wheat (CIMMYT and ICARDA), crop diversification (ICARDA, ICRISAT and IRRI), IPM (ICARDA and CIMMYT), soil and water management (ICARDA and IWMI), feed and livestock development (ICARDA and ILRI), plant genetic resources (IPGRI, ICARDA and CIMMYT), and human resource development involving all centers, including CIP, the details of which have been included in this report. PFU is also trying to facilitate the activities of other centers of the Consortium, who do not have their staff located in the region. Specific details of inter-center partnership have been mentioned in this report.

## **6.9 Publications**

Regular issues of CAC News are being published and circulated among all stakeholders. The latest issue of January-March, 2004 has already been brought out.

The proceedings of the Central Asia Symposium organized in Indianapolis in November, 2002, has been edited by Drs. John Ryan, Paul Vlek and Raj Paroda and it is currently in the press.

A book on “Rangelands of the Arid and Semiarid Zones in Uzbekistan” was published by CIRAD-ICARDA under the joint authorship of Drs. G. Gintzbürger, K. Toderich, B. Mardonov and M. Mahmudov.

The proceedings of the First Central Asian Wheat Conference is being edited to be published this year.

The proceedings of the regional workshop on “Bed-planting Technology of Wheat Cultivation”, organized by CIMMYT-CAC, has been published and is being circulated widely in the region.

Several publications on establishment and management of Water Users Associations (WUA) have been brought out by IWMI in English, Russian and local languages. These have also been widely circulated in Kyrgyzstan, Tajikistan and Uzbekistan.

A training module on “Using Molecular Marker Technology in Studies on Plant Genetic Diversity” developed by IPGRI, has been translated and published in Russian. The module is intended for scientists with a minimal background in genetics and plant molecular biology, but with a working knowledge of plant genetic resources and issues concerning their conservation and management.

## **6.10 Program Web Site**

The web site of the CGIAR Collaborative Program for CAC is available on the Internet since September, 2001. Being linked to CGIAR and ICARDA websites, the Program site contains the basic information on CG Centers and NARS-CAC involved in the program activities, detailed information on each country of CAC region, texts of the Collaborative CGIAR Program for CAC and the Strategy on its development, and other useful information. The site is also being regularly updated with news releases, current program reports and publications covering recent achievements of the collaborative research activities. Those interested are welcome to visit our site at: [www.icarda.cgiar.org/cac/index.htm](http://www.icarda.cgiar.org/cac/index.htm). It is also linked to a CIMMYT launched web site

<http://www.semena.kz> in Russian language, which provides the information about GTZ-CIMMYT project, germplasm exchange, new varieties and technologies.