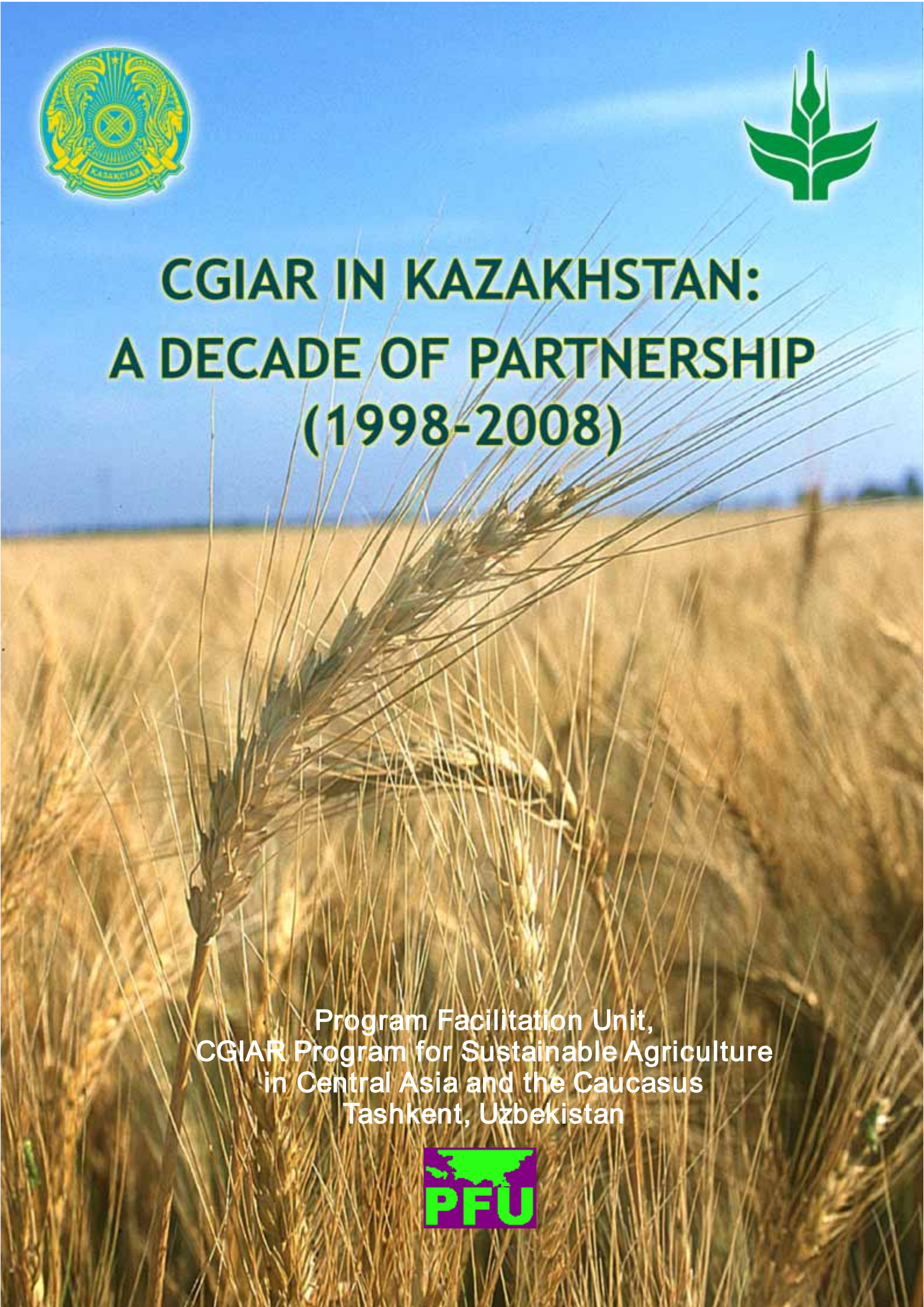

CGIAR IN KAZAKHSTAN: A DECADE OF PARTNERSHIP (1998-2008)

Program Facilitation Unit,
CGIAR Program for Sustainable Agriculture
in Central Asia and the Caucasus
Tashkent, Uzbekistan

PFU

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About CGIAR

The Consultative Group on International Agricultural Research (CGIAR) is an association of public and private members supporting a system of 15 agricultural research Centers. They work in more than 100 countries to mobilize cutting-edge science to reduce hunger and poverty, improve nutrition and health, and protect the environment in developing countries. The CGIAR receives support from a wide range of countries and institutional members worldwide. The CGIAR conducts strategic and applied research and its products are international public goods. It focuses its research on problem-solving through inter-disciplinary programs implemented by one or more of its Centers, in collaboration with a full range of partners.

FOREWORD

It is a highly important and honorable occasion for the Republic of Kazakhstan to host the 11th Steering Committee Meeting of CGIAR program for Central Asia and the Caucasus (CAC), which involves eight CG Centers, three Advanced Research Institutes (ARIs), and National Agricultural Research Systems (NARS) from the eight countries of Central Asia and the Caucasus (Azerbaijan, Armenia, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan).

At the present time, the level of development of the agro-industrial sector of Kazakhstan can be characterized as stable. Increased public investments into agricultural production and research, consistent work on improvement of farming practices, agricultural diversification, human resource development and other initiatives are contributing to achieving progress in agricultural production and processing of agricultural products, including of cereals.

In his message to the people of Kazakhstan in 2008 entitled “Growth in prosperity of the citizens of Kazakhstan – the main goal of State policy”, the President of the Republic of Kazakhstan, N.A. Nazarbaev, noted that the agro-industrial sector should become an important high-income generating sector of economy. In this regard, further action has been taken at all levels to provide comprehensive support to agriculture.

One of the priority objectives of the agro-industrial sector in Kazakhstan is the advancement of research and development, as well as of innovations, which will allow achieving competitiveness in the world market.

It is obvious that it is impossible to attain these objectives without making use of global experiences and active international collaboration, first of all, in the area of research. Within the framework of the CGIAR program for CAC, the research institutes of the Ministry of Agriculture of the Republic of Kazakhstan carry out joint activities with a wide range of International Centers and organizations, such as ICARDA, CIMMYT, Bioversity International, IWMI, CIP, IRRI, AVRDC, ICBA, as well as FAO, GTZ, and ACIAR.

Joint research activities with International Centers have provided the opportunity to use the global experiences in sustainable agricultural production. As a result, thousands of valuable accessions of plant genetic resources have been received from international nurseries, new high-yielding varieties of crops have been selected, modern resource-conserving technologies have been adapted to local conditions, the potential of highly qualified scientists is being further improved thanks to English language courses, participation in international trainings, seminars and other capacity building events.

Expressing our gratitude to the CGIAR Program for CAC for this collaboration, we would also like to express our hope for its further development in different spheres of agricultural research and production.

Acad. Akylbek Kurishbaev
Minister of Agriculture,
Republic of Kazakhstan

FOREWORD

Since its independence in 1991, Kazakhstan has achieved remarkable successes in transforming its centralized economy to a market-driven one. However, this transition has been challenging in many respects, especially in agriculture. The disappearance of agricultural support systems, disruption of existing trade linkages, degradation of rangelands, and increased salinization and waterlogging in irrigated areas, have all led to a steep decline in agricultural productivity, severely affecting the welfare of rural populations.

These concerns prompted international attention, which culminated in a ministerial-level meeting in Lucerne, Switzerland, in 1995. As a sequel to the meeting, in 1996, a CGIAR-commissioned Task Force recommended that the eight countries of Central Asia and the Caucasus (CAC) be included in the CGIAR's geographic mandate. In 1997, nine CGIAR Centers formed a consortium to develop a 'CGIAR Collaborative Research Program for Sustainable Agricultural Development in CAC'. The CAC Program has made good progress, assisting the Kazakhstan national research program to reorient its research agenda and work more closely with CGIAR Centers and other research institutions in the region. It has also helped to strengthen much-needed human resource capacity.

As a result of consistent economic reforms, strong government commitment and tireless efforts by Kazakh scientists and their international colleagues, agricultural development has accelerated, contributing to improved livelihoods of rural people and to the overall development of the country.

There is potential for even more growth. With its huge potential to expand cultivated area, Kazakhstan can play a key role in achieving global food security, and preventing food crises such as the ones seen recently in many countries. To sustain and even expand agricultural growth, it is vital that the national programs in Kazakhstan and all other CAC countries, CGIAR Centers, donor agencies and other stakeholders further strengthen their support for the CGIAR-CAC Program. The Program has helped catalyze change, and continued support from various stakeholders will sustain this momentum. We have good partnerships in place. We now need to strengthen and expand them to reach our goal of sustainable agriculture in Central Asia and the Caucasus.

Dr. Emile Frison,
Co-Chairman,
CGIAR-CAC Program Steering Committee
Director General,
Bioversity International

Dr. Mahmoud Solh,
Chairman,
CDC Task Force for CAC
Director General,
ICARDA

AKNOWLEDGEMENTS

The excellent cooperation and invaluable contribution made by our colleagues from Kazakhstan as well as the CG Centers and other international organizations involved as partners in the CGIAR Consortium for CAC, is duly acknowledged. Without their active involvement, commitment and support, the achievements reported in this publication would not have been possible. Special thanks go to the CIMMYT colleagues working in Kazakhstan who have, above measure, contributed to the CG work in Kazakhstan. Also, the help extended by all the staff working in the PFU office in Tashkent is very much appreciated.

Dr. Christopher Martius
Head, Program Facilitation Unit (PFU),
CGIAR Program for CAC

ABBREVIATIONS

ACIAR	Australian Center for International Agricultural Research
ARD	Agricultural Research for Development
ARI	Advanced Research Institute
AVRDC	The World Vegetable Center
CA	Conservation Agriculture
CAC	Central Asia and the Caucasus
CACAARI	Central Asia and the Caucasus Association of Agricultural Research Institutions
CATCN-PGR	Central Asian and Trans-Caucasian Network for Plant Genetic Resources
CCER	Consortium Comissioned External Review
CGIAR	Consultative Group on International Agricultural Research
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo
CIP	International Potato Center
GFAR	Global Forum for Agricultural Research
ICARDA	International Center for Agricultural Research in the Dry Areas
ICBA	International Center for Biosaline Agriculture
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
IPM	Integrated Pest Management
IRRI	International Rice Research Institute
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
KASIB	Kazakhstan-Siberia Network on Improvement of Spring Wheat
MTP	Medium Term Plan
NACAR	National Academic Center for Agricultural Research
NARS	National Agricultural Research System
PFU	Program Facilitation Unit
PGR	Plant Genetic Resources
PGRFA	Plant Genetic Resources for Food and Agriculture
PSC	Program Steering Committee
RAIS	Regional Agricultural Information System
RCT	Resource Conserving Technology
SVTC	State Variety Testing Commission
TAC	Technical Advisory Committee
TRRC	Temperate Rice Research Consortium
USDA	United States Department of Agriculture
WUA	Water Users Association

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COLLABORATIVE PROGRAM FOR STRENGTHENING AGRICULTURAL RESEARCH

After experiencing a sometimes drastic decline of cropped land, of agricultural production and the ebbing of the performance in their agricultural research systems that followed their independence from the former Soviet Union, the eight countries of Central Asia and the Caucasus started realizing the need to strengthen and revitalize their agricultural sectors. In the process, they also realized that they needed more investment in and greater attention to agricultural research and development. They understood the need to reorganize their respective national programs and to develop linkages with other partners in the global agricultural research community in order to sustain and improve the existing research infrastructure. All countries expressed a desire that the CGIAR Centers assist them in their efforts in agricultural research and development.

Following the Ministerial-Level Meeting held in 1995 in Lucerne, Switzerland, and the recommendations of the CGIAR-commissioned Task Force in 1996, a decision was taken to expand the geographic mandate of CGIAR to also include the eight CAC countries. In 1997, nine CG Centers formed a Consortium to develop a CGIAR Collaborative Research Program for Sustainable Agricultural Development in CAC. These CG Centers jointly developed a Technical Program Proposal for 5 years in May 1998 based on the needs of all the eight NARS and submitted to the Technical Advisory Committee (TAC). Based on recommendations of TAC, the Program proposal was approved by the CGIAR during the Annual General Meeting in 1997, with initial funding support from the World Bank.

After the approval of the proposal by the CGIAR, a Collaborative Research Program on Sustainable Agricultural Development in Central Asia and the Caucasus was jointly initiated by the nine CG Centers and the eight CAC NARS in 1998. Thus, the Program was started in September 1998, after its approval by the Program Steering Committee (PSC) in its meeting held on 28-29 September 1998 in Tashkent, Uzbekistan. Also a Program Facilitation Unit (PFU) was established in the Regional CAC Program Office of ICARDA in Tashkent to provide a facilitation function for the inter-center and inter-NARS initiatives in the region. In 2004, the World Vegetable Center (then AVRDC) joined the Consortium as a

First Meeting of Stakeholders in Tashkent, December 1995

new partner to strengthen vegetable research and development activities in the region. In 2005, International Center for Biosaline Agriculture (ICBA) and Michigan State University also became Consortium partners to contribute to the activities of the program in their respective fields of expertise. IRRI, which joined in 2002 as the ninth Consortium partner for providing support for rice research and development, has left the consortium in April 2008 after handling the rice research in CAC countries over to the Temperate Rice Research Consortium (TRRC). In 2007, a sub-regional office of the PFU-ICARDA was opened in Tbilisi, Georgia, to provide further enhanced facilitation and support to the collaborative activities of the Consortium partners in the Caucasus.

A well-established partnership between CGIAR Centers and NARS of Kazakhstan has been the key factor for the Program's success achieved in a very short time. The focal partner of the CG Centers in Kazakhstan is the Ministry of Agriculture of Kazakhstan, currently with Acad. Akylbek Kurishbaev, Minster of Agriculture of Kazakhstan, as the National Focal Point.

Several agreements and memoranda of understanding with various institutions in Kazakhstan form the strong basis for collaboration between the CG Centers and the NARS of Kazakhstan. These agreements include the Agreement between Newly Independent Republics of Central Asia and ICARDA signed in November, 1995; the Memorandum of Agreement between the National Academic Center for Agricultural Research of Kazakhstan (NACAR) and ICARDA signed in 2001; and agreements between ICARDA and the National Water Management Institute of Kazakhstan based in Taraz (1999), as well as between ICARDA and the Kazakh National Agrarian University (2003). This publication highlights the achievements of the joint collaborative research program for sustainable agriculture of Kazakhstan and the CGIAR.

GERMPLASM ENHANCEMENT

In 2007, Kazakhstan harvested 20.1 million tons of cereals with an average yield of 1.33 t/ha. Local varieties bred in Kazakhstan occupied about 6 mln ha of the total area under cereals. Access to promising collections of germplasm with high genetic and adaptive characteristics is an important source for selection of new, highly competitive varieties.

In Kazakhstan, breeding activities are conducted on more than 60 agricultural crops. Between 2001 and 2007, more than 350 new varieties and hybrids of agricultural crops, including varieties of wheat, barley, potato, vegetables and legumes, selected by Kazakh scientists in collaboration with CIMMYT, ICARDA, CIP, and AVRDC, had been submitted to State varietal testing for subsequent release and adoption.

The main priorities for the new crop varieties selected under the germplasm improvement activities in Kazakhstan are:

- High genetic productivity, stability of characteristics and wide adaptability;
- High nutrient contents (proteins, oils, sugar, starch, important microelements and others);
- Resistance to biotic stresses (diseases and pests)
- Resistance to abiotic stresses (heat, drought, frost, lodging, herbicides, heavy rates of fertilizers, heavy metals, radionuclide elements, toxins and others).

To achieve this, every year, the research institutes of Kazakhstan receive numerous germplasm materials from CIMMYT and ICARDA. These materials are used as:

- basic material for determination of donors and sources of economically valuable characteristics;
- components of parental forms in programs of hybridization for improving productivity and resistance to biotic and abiotic stresses;
- elite material for development of new commercial varieties.

As a result of the joint germplasm enhancement activities between the NARS of Kazakhstan and the International Centers involved in the CAC Consortium, one variety of winter wheat (*Egemen*), one variety of barley (*Zhybek Zholy*), two varieties of chickpea (*Janalyk* and *ICARDA 1*), and one variety of grass pea (*Ali Bar*) were released.

WHEAT

Under the activities on "Development and improvement of the gene pool of cereals" (1998-2004), the following studies were carried by the Scientific Production Center of Farming and Plant Breeding led by Dr. Esimbekova, jointly with ICARDA, CIMMYT, and GTZ:

- International varietal testing of winter and facultative wheat lines from different geographic sources for resistance to yellow rust. Most of yellow rust resistant lines were from USA, the Ukraine, Hungary, Bulgaria, and the Czech Republic. In regional nurseries, lines from Armenia, Azerbaijan, and Georgia also proved to be highly resistant to yellow rust.
- A regional nursery, containing materials from Central Asian and the Caucasian countries, was established. The materials were sent to 10 ecologic zones. One hundred and fifty accessions and five ecologic zones resistant to yellow rust have been selected in the project countries Kazakhstan, Uzbekistan, and Kyrgyzstan.

Regional representative of CIMMYT, Dr. Morgunov A. and Deputy Director of Karabalyk station, Dr. Berdagulov M. on the fields of Karabalyk Agricultural Station (2006)

In 2005, 172 lines of winter and facultative wheat have been studied for frost resistance in five research sites in Northern Kazakhstan and 30 high-yielding lines of cereals have been selected fororganization of demonstration trials under the ICAR project on "Demonstrational planting of high-yielding varieties of winter wheat from national and international nurseries using modern technologies of efficient water use and fertilizer application".

Since 2000, 4,332 lines of wheat, triticale and barley originating from 28 countries of the world were received from the international nurseries of CIMMYT and ICARDA. These lines were studied at the Scientific Production Center of Farming and Plant Breeding. The trials showed that throughout this period 82%-65% of these lines were capable to survive the harsh winter periods in Kazakhstan. In terms of maturity, 69.5% of these lines were found to be early-maturing, 23.9% medium-maturing and 6,6% late-maturing. The high-yielding, disease-resistant variety of winter wheat Tungush, developed jointly with CIMMYT, has been submitted to State Varietal Testing Commission (SVTC).

Since 2003, an agreement has been reached with CIMMYT Representative Office in CAC on carrying out of wheat improvement activities under the Kazakhstan-Siberia Network on Improvement of Spring Wheat (KASIB). This program is funded by GTZ and implemented by CIMMYT.

The Eastern-Kazakhstan Research Institute of Agriculture has studied 884 varieties, lines and hybrid populations of spring bread wheat in collaboration with CIMMYT under the KASIB program. The lines distinguished for their high yield, resistance to brown rust, qualitative features were used in breeding as parental and maternal forms for hybridization in 2006-2007. The Karaganda Research Institute of Plant Industry and Breeding has studied 419 newly released and promising varieties and hybrids. New promising varieties, involving lines from the KASIB network, are being evaluated in breeding and control nurseries. KASIB lines have demonstrated yield gains of up to 0.5 t/ha over the local control varieties as well as superior seed quality.

Between 1996 and 2007, the new wheat varieties Ak dan, Konditerskaya, Krasnovodopadskaya 97, and the triticale variety Orda, have been selected from CIMMYT and ICARDA materials at Krasnovodopad station in Southern Kazakhstan. Krasnovodopadskaya 97 and Orda are expected to be released in 2008.

An international "shuttle breeding" trial of released wheat varieties from Kazakhstan, Western Siberia,

Canada, USA, Mexico and China was carried out in collaboration with CIMMYT. In this trial, two varieties from Kazakhstan, Karagandinskaya 70 and Karabalykskaya 90, demonstrated lead performance not only in Kazakhstan, but also in other participating countries. In addition, all twelve partners in the program highly appreciated the varieties Karagandinskaya 22, released in Central and Northern Kazakhstan, and Sary-Arka 27, which is currently under State variety testing in Kazakhstan.

The KASIB program allowed Pavlodar Research Institute of Agriculture to participate in evaluation of promising lines of spring wheat in 13 ecological zones in Kazakhstan and Siberia. In addition, thanks to this program the gene pool of the Institute has been increased with 500 lines of spring wheat. In total, more than 600 hybrid combinations have been received from CIMMYT and were included to the breeding process.

ICARDA partners and scientists from Kazakhstan evaluating the performance of new wheat varieties, Krasniy Vodopad station, Kazakhstan (from left to right: Dr. Bitore Djumakhanov, breeder, ICARDA, Dr. Rahimdjan Medeubaev, Agronomist, and Dr. Anarbay Ortayev, Deputy Director, Krasniy Vodopad Station)

At Karabalyk Agricultural Station, about 2 thousand lines of spring bread and durum wheat comingfrom different nurseries in Mexico have been studied since 1999, under the KASIB program since 2000. Every year the material is re-seeded for more comprehensive studies, and selection is made in hybrid populations. The most adapted and valuable accessions are used as parental forms in crossings. In this regard, lines from CIMMYT which are highly resistant to brown leaf rust (Puccinia recondita Desm.) are of high interest. In the cropping seasons of 2002, 2005, and 2007, when the weather facilitated intense development of fungi diseases, 22 lines with high resistance to brown rust were identified as parental forms for further use. These lines proved to be productive and highly adaptable to Northern Kazakhstan, which allows for their active inclusion in hybridization.

Under the project "International collaboration in agricultural research in Central Asia and the Caucasus" (2002-2004), scientists and teachers of the Seifullin Agro-technical University jointly with CIMMYT and the University of South Dakota, carried out activities on adaptation to local conditions of the best cultivars of spring wheat and winter wheat.

BARLEY

Barley is the second crop after wheat by area in Kazakhstan: in 2007, it occupied more than 1.9 mln ha in the country. In the Scientific Production Center of Farming and Plant Breeding, under the supervision of Prof. B.S. Sariev, 5,400 lines of barley have been studied since 1998 under ICARDA's Barley Improvement Program. From these, 194 lines have been selected thanks to their economically valuable characteristics (short vegetation period, high 1000-kernel-weight of 50-56 g, high productivity of 7.0-9.7 t/ha, low protein content of 11.7%, and high protein content of 15.0-17.5 %). The barley variety Kuralai was submitted to State variety testing in 2007.

At Krasnovodopad station in Southern Kazakhstan the barley varieties Atameken and Zhybek Zholy, have been selected from ICARDA materials.

In the Research Institute of Rice (Priaral Research Institute of Agro-ecology and Agriculture), ecological evaluation of salt resistant barley varieties has been carried out in collaboration with ICARDA and ICBA in 2006-2007. Two-hundred and eighty accessions from ICARDA collection were used in these efforts. The selected lines, such as 7/98-01, 5-115, 519978, 5-9, 11/17-01(Syria), Bi-17 and Bi-41 (Iran) distinguish themselves by early maturity and high productivity, and are expected to be used as parental forms in hybridization.

LEGUMES

In the Scientific Production Center of Farming and Plant Breeding, studies on breeding of new soybean, chickpea, vetch, and lentil varieties have been carried out under the supervision of Dr. Jansybaev since 1998 within the framework of ICARDA's Legume Improvement Program. It has been found that all legume materials received from ICARDA nurseries have drought- and heat-resistant genes.

The chickpea variety Janalyk has been selected from ICARDA material at Krasnovodopad station in Southern Kazakhstan. In 2003, the chickpea variety ICARDA 1 was submitted to State variety testing; starting from 2007, this variety is released for wide-scale adoption in Almaty, Jambyl and South-Kazakhstan regions.

ICARDA representatives with the scientists of Scientific-Production Center of Grain Husbandry under the Name of A.I. Baraev: examination of leguminous collections on the field

Dr. Malhotra, ICARDA, with Kazakh chickpea breaders ievaluating the performance of improved chickpea lines.

RICE

Research Institute of Rice (Priaral Research Institute of Agro-ecology and Agriculture) has scientific links with IRRI, the International Rice Research Institute, through a signed agreement on the exchange of rice materials for gene pool replenishment. In addition, scientific information is exchanged, and personnel are being trained. Contacts with IRRI are implemented through PFU.

Activities on "Replenishment of the national collection of rice plant resources of the Republic of Kazakhstan" were implemented in 2005 – 2007. The national rice gene pool of Kazakhstan was increased with 343 salt-tolerant and frost-resistant accessions of rice, which are used in breeding programs in Kazakhstan.

With the participation of PFU and IRRI, a regional rice trial was conducted in 2006-2007 in Central Asia. 11 rice varieties from Uzbekistan and Tajikistan were studied, and 2 perspective varieties which are maturing under the harsh conditions of Kyzylorda region were selected.

POTATO

Twenty advanced elite potato clones, supplied in-vitro by CIP, Lima, to the Research Center of Potato and Vegetable Farming, Almaty region, in 2005, and which are combining characters such as resistance to viruses, earliness, tolerance to abiotic stresses and high tuber quality. Of these, two promising clones were selected in 2007, to be delivered to the State Commissions for Variety Testing for further release; they are CIP No. 397077-16 (candidate name: Alliance) and 388676-1 (candidate name: Miras).

CIP No. 397077-16 was classified as a medium maturity clone, with a yield of 32.8 t/ha under research conditions, an average tuber weight of 112 g, and a marketability of 94%.

Staff of the Research Institute of Potato & Vegetable Farming, Almaty region, together with Dr. Carlo Carli, CIP-Tashkent (fourth from left)

Candidate potato varieties Alliance...

...and Miras

The other clone, 388676-1, was classified as mid-early, with a yield of 33.1 t/ha, an average tuber weight of 110 g and a marketability of 93%. Their content in dry matter, starch (>20%) and vitamin C out-yielded those of standard checks with the varieties Aksor and Tamasha. With regard to virus diseases and abiotic stresses commonly found in Kazakhstan, they reacted very well in comparison with the standard checks (cf. Table 1).

***Table 1**: Relative reaction of the candidate potato varieties Alliance (397077-16) and Miras (388676-1) to environmental conditions of Kazakhstan, in comparison with standard checks*

Factor	Response
Adaptation to soil conditions	highly responsive to mellow, medium loamy soils
Reaction to fertilizers	highly responsive to of organic and mineral fertilizers
Reaction to moisture	positive
Heat tolerance in southern Kazakhstan	Miras (388676-1) is heat tolerant
Drought resistance	Alliance (397077-16) is relatively drought resistant
Frost resistance	Similar to the level of standard checks
Keeping tuber quality	good

VEGETABLES AND FRUITS

The Research Institute of Potato and Vegetable Farming also actively collaborates with AVRDC – The World Vegetable Center. Activities on replenishment of vegetable and fruit gene pools are carried out together with AVRDC. Between 2005-2007, the Research Institute of Potato and Vegetable Farming received 309 accessions of tomato (71), sweet and hot pepper (231), eggplant (4) and soybean (3) from the AVRDC- World Vegetable Center. The evaluation of these materials showed that all the received accessions of tomato, eggplant, sweet and hot pepper were well adapted to local conditions and were pest- and disease-resistant. Sweet pepper lines 0237-7011, 0037-7645, PBC 762 sel, 9946-2192 and hot pepper lines 9950-5197, 9955-15, 0337-7069 and PBC-142 have shown better results as compared to local standard varieties. To illustrate, all the four lines of sweet pepper out-yielded the local standard varieities of Podarok Moldovy and Lastochka.

Partners from the World Vegetable Center and the Research Center of Potato and Vegetable Farming are evaluating soybean trials

As a result, the sweet pepper variety Kaz-Tai (PBC 762 sel) and the hot pepper variety Pikant (9950-5197) have been submitted to SVTC.

Three young researchers from the Institute were trained by the World Vegetable Center both at its Head Quarters in Taiwan (2) and at its Regional office for CAC in Tashkent, Uzbekistan (1).

Promising sweet(left) and hot(right) pepper lines

The Research Institute of Fruit Crops and Viticulture is the key partner of Biodiversity International for implementing the project on "In situ/on farm preservation and use of agrobiodiversity (fruit crops and wild species) in Central Asia" (2006-2010).

Under this project, information on 63 varieties of apples, 4 varieties of pear, 12 varieties of apricots, 37 varieties of grapes has been collected. Fifty-five peasant holdings of Almaty, Jambyl and South-Kazakhstan regions have been studied. Participatory evaluation of fruit crops and grapes diversity at seven project sites has been conducted. Jointly with the national department of project implementation, four training seminars, as well as two traveling seminars for peasants and farmers have been organized. About 250 people took part in these training events. A brochure entitled "Preservation of genetic diversity of fruit plants – a passport to success" has been issued in Kazakh language; a number of other brochures, booklets and recommendations have also been prepared for publication.

INTEGRATED PEST MANAGEMENT

The Specialized Institute in the Sphere of Pest Management and Phytosanitary Safety – Research Institute of Pest Management (Director, Prof. A.O Sagitov) together with Washington State University and CIMMYT implemented research activities on "Application of mechanic and chemical measures of weed control in three field wheat-fallow crop rotation at seed production farms of Northern Kazakhstan". As a result, the system of weed quantity control in wheat production was developed on the basis of agroecobiological criteria of harmfulness of the weeds, thresholds of harmfulness and survival coefficients, "critical periods", as well as competitive ability of cultivated and weed plants (mathematic model). Zonal farm practices were evaluated, and the influence of mineral fertilizers and herbicides on weed density were assessed in order to increase the productivity wheat.

Dr. Amor Yahyaoui, ICARDA, with his Kazakh colleagues monitoring wheat rusts

In addition, research on wheat cultivation technology was conducted in 2004. As a result, the phytosanitary evaluation of raised bed cultivation of winter wheat was completed. The tendency of earlier appearance and intense development of diseases with leaf-stem infection in crops planted with traditional technology was noted at a seeding rate 4-5 million pieces/ha with inter-row spacing of 15 cm. Application of phosphoric fertilizer on beds, furrows and through broadcasting did not influence the appearance of air-borne diseases.

In 2004-2005, studies on evaluation of the efficiency of chemical protection of winter wheat from diseases with air-borne infection were implemented with the support of CIMMYT. Optimal terms and frequency of cultivation of winter wheat considering the dynamics of disease development were determined. Biological, domestic and economic efficiency of seeds and crops cultivation with fungicide application during vegetation period were assessed. It was found that these techniques provided with effective protection of winter wheat from main diseases of seed and leaf-stem and facilitated to preservation of additional grain ranging from 0.2-0.3 t/ha to 0.7-1.0 t/ha. The profitability achieved with protective measures exceeded the costs incurred on them by 3-4 times.

Prof. Murat Karabayev, CIMMYT-Kazakhstan Representative (right); Dr. Patrick Wall, CIMMYT Principal Scientist (left); Shetski region, Central Kazakhstan, World Bank Dryland Management Project, July, 2007

On the basis of a subcontract with Washington University and CIMMYT, a project on "Protection of the spring wheat from Hessian fly on the basis of cultivation of tolerant varieties" was implemented in 2004-2006. One-hundred seventy-seven lines of spring wheat from the KASIB network have been evaluated for resistance to Hessian fly. Tolerant varieties and hybrids in general are presented by breeding institutions of Southern Kazakhstan. A large group of tolerant wheat lines was selected from CIMMYT's international nursery. These varieties are from China, USA and Canada.

Activities on the control of Crotalaria population through testing of microbiological products were successfully implemented in 2005-2007 jointly with ICARDA.

CROP DIVERSIFICATION AND RESOURCE CONSERVING TECHNOLOGIES

In 2007, cultivated areas of all agricultural crops comprised 18.9 mln ha in Kazakhstan, including an area of 12.9 mln ha under wheat.

The Government policy in the agricultural sector envisages increasing the cultivation of highly profitable, export-oriented agricultural crops, including varieties of durum wheat, malting quality barley, oats, oilseeds, legumes, sugar beat, vegetables and fruits. Therefore, breeding activities and farming technologies are important benefits from international cooperation.

Field pea, chickpea, lentil, rapeseed and buckwheat lines selected together with ICARDA are considered as having good perspective for diversification and inclusion into crop rotations in spring wheat systems in Northern Kazakhstan. For rainfed farming systems based on winter wheat, safflower is considered to have a good perspective.

EVALUATION OF HALOPHYTES

Research activities of the International Center for Biosaline Agriculture (ICBA) in Kazakhstan have been focusing on the introduction and evaluation of wild halophytes and various salt tolerant crops; the development of technology of cultivation and management options to increase productivity and income generation on salt-affected and waterlogged soils. This is being achieved through field-based trials in several sites (a private Farm in Makhtaral, located in close proximity to the Institute of Cotton Production, Southern Kazakhstan and on the marginal lands of Djambul region, at Besagash experimental station of the Institute of Irrigation and Melioration. In 2007 demonstration experimental plots on evaluation of various species of halophytes and improved lines of sorghum and pearl millet were established at the highly saline marginal lands in the Kyzylorda region at the Priaral Research Institute of Agro-ecology and Agrochemistry.

Performance of sorghum in Southern Kazakhstan

The research results achieved so far show that, where the crop-livestock (mixed) farming system is widely practiced, dual-purpose (grain and fodder) cereals are considered as one of the important strategies for improvement of productivity of salt affected marginal lands and better income and livelihood of poor rural communities and farmers. Dual-purpose sorghum under irrigated summer season in two agro-climatic zones of Kazakhstan could be taken up as a second crop after early legumes or wheat and barley. Under the condition of intensification of agriculture and, consequently, increasing of secondary soil salinization in Kyzylorda region these two perspective cereals showed good results as second crop after harvesting of barley in the rice crop rotation system. In this region there would be a huge demand for sorghum and pearl millet grain for feeding of animal and poultry.

High productive, fast growing, thin-stemmed tall and early maturing (104-118 days) Sorghum improved lines introduced by ICBA, such as Speed feed, Super Dan, Sugar Graze, Pioneer 858, SP 40516 and SP 39269 under the condition of Kazakhstan showed significant seed germination (79-95%) and higher growth rates, plant height (240-295 cm), and accumulation of green (57,49-96,48 t ha-1) and dry biomass (24,82-32,21 t ha-1) at the plant density of 27.0-82.0 ФЩУ./ЗБ.

Screening of pear millet germplasm by using of 12 agro-biological traits indicates that IP 6110, Guerinin-4, IP 3616, ICMS 7704 (a very fast-growing and early maturing cultivar with a yield of fresh biomass of 42.0 t ha-1 at a plant density of 126 plants/ha), IP 6110, HHVDBC Tall , MC 94 C2, Daura Genopool, Sudan Pop III accessions showed best results both highest rate of seasonal growth and plant survival, as well as in green biomass accumulation (yield of fresh biomass at 50% of plant heading varies from 6,200 up to 10,400 kg/m2 with a plant density of (65-94 plant/m2), height of plant as 250 – 296 cm and number of basal tillers: 4.9-6.8 respectively). Improved populations of pearl millet like Raj 171 (W), HHVBC tall, IP 19586, Wraj pop, Gurenian-4 Sudan Pop III showed a good re growth ability (at least one/two cuttings per one vegetation season) and seed maturationand high seed quality during September-October.

PLANT GENETIC RESOURCES

Kazakhstan represents a rich primary and secondary gene pool of many crops and wild plants. The country is the source of origin of many fruits and vegetables. Such wealth of biodiversity is the result of multitude of soil-climatic conditions and landscapes in the territory of Kazakhstan that historically promoted the generation of plant types and intra-group forms.

Participants of the Regional workshop «Policy regarding plant genetic resources and legislation of varieties protection» (16-18 July 2007, Tashkent).

The Western and Northern Tien-Shan (in the southern and south-eastern regions of Kazakhstan) have been defined by Acad. Vavilov, both by number of endemic species and by diversity of specific and generic potential, as the 3rd Central Asian Center of origin of cultivated plants. Out of 6,000 types of vascular plants of Kazakhstan's flora more than 210 are wild species of agricultural crops.

Many wild landraces and wild relatives of cereal and fodder crops are under the threat of genetic erosion because of the worsening of ecology, urbanization and intensive agricultural cultivation.

Therefore, collection, evaluation, documentation and conservation of plant genetic resources are the priorities of agro-industrial complex and science, and a vital component of food security.

Every year, the funding for national programs on agrobiodiversity is increasing. Within the framework of the program on "Applied scientific studies in the agro-industrial sector", the activities on collection, evaluation, and conservation of the gene pool of agricultural crops are being carried out in 27 institutes of the Ministry of Agriculture and the Ministry of Education and Science of Kazakhstan. In addition, significant work has been done on PGR collection, analysis, evaluation and documentation jointly with ICARDA.

During the visit to the Network of US National Plant Germplasm System in 2006

Under the CGIAR Consortium for CAC, the Central Asian and Trans Caucasian Network on Plant Genetic Resources (CATCN-PGR) was established with participation of the eight countries and with the assistance of Bioversity International and ICARDA in 1999. Under CATCN-PGR, a group for the coordination of activities in the sphere of PGR has been created at the Scientific-Production Center of Farming and Plant Breeding. Dr. Alimgazinova, Head of the Science Department of the Ministry of Agriculture of Kazakhstan, has been nominated as PGR National Coordinator by a decree of the Ministry of Agriculture of Kazakhstan.

Specialists have been trained by ICARDA in PGR inventory and documentation. ICARDA also provided computers for making the inventory and documentation of available PGR collections.

A joint FAO - Bioversity International project on "National mechanism of information exchange for the implementation of Global action plan in the Republic of Kazakhstan" (2004-2006) provided opportunities for the performing organizations to highlight the activities in the area of PGR, contribute to the process of decisions making and widen the efforts on national and international levels. On the basis

of data collected under this project, the strategic report for FAO on the status of plant genetic resources for food and agriculture in the country was prepared.

The national passport data base on PGR in Kazakhstan is under establishment according to international descriptors. To catalyze this effort, an ICARDA project on PGR documentation was implemented, which also included training of human resources.

Under the project on "In situ/on farm conservation and use of agrobiodiversity (horticulture crops and wild fruit species) in Central Asia" the analysis of legislative/normative acts in natural reserves and development of farm holdings has been carried out, proposals regarding establishment of associations of farmers-gardeners, as well as information about local fruit and cereal varieties and their wild species with description of agro-morphological characteristics and the regions of their growing have been prepared, seminars for farmers were carried out and programs have been broadcast on the national television and radio network. A project web-site was created, and needed equipment was purchased.

The center of origin and diversity of apple is located – as for many other temperate fruit trees in Central Asia and Caucasus region (CAC). Wild natural forests of apples can be still found in mountainous areas of the region, whereas many local varieties, maintained by generations of farmers, are still grown in home gardens. The genetic diversity present in natural forests as well as in farms and home gardens across the region is estimated to be very rich, but its total extent is not known yet and still largely untapped.

Apples of Kazakhstan

In CAC apple genetic resources are conserved mainly in field Genebanks. In Kazakhstan and Turkmenistan ex situ field collections of fruit crops (including apple) have been established during the Soviet era. The Pomological Gardens and Garrygalla Research and Production Center on Plant Genetic Resources (a former branch of the All Union Institute of Plant Industry -VIR), in Turkmenistan are maintaining an important collection of apple diversity, including unique, local varieties and wild relatives. Both institutions face serious difficulties to maintain effectively their collections. These needed to be adequately duplicated and safely managed. Immediate actions were needed to protect their unique apple collections. A comprehensive assessment of such collections is needed to shed light on diversity that has never been studied so far. In order to secure important field collections of apple in Kazakhstan and Turkmenistan with support of Global Crop Diversity Trust, Bioversity International started the project there per recommendation of CATCN-PGR Network.

The main objectives of the project:

- Upgrade field Genebank facilities and operations at Pomological Gardens, Kazakhstan and Garrygalla Research Center on PGR, Turkmenistan;
- Improve strategies and standards for managing the collections;
- Develop the capacity and skills of Genebank staff;
- Improve characterization and documentation of the collections;
- Improve communication and exchange of germplasm between two collections, scientists and farmers community;
- Ensure safety duplication of the most important apple accessions by local people, on farms and in home gardens and in two collections.

Expected outputs:

- Both ex situ field collections of apple genetic resources are maintained properly, are well

equipped and have sufficient human resources to continue an efficient and sustainable management of the collections;

- A set of management standards for apple field collections ia prepared and adopted by the target Genebanks;
- All apple accessions in both field collections are evaluated and data is documented in computerized databases. Data are made accessiblr to the larger scientific community;
- The apple diversity of the collections is assessed and possible duplications of accessions are identified for a more effective management and use of apple's gene pool;
- Better availability of apple diversity to breeders, farmers and other users;
- Staff working at the collections are properly trained.

In 2006, ICARDA supported the reconstruction of premises and procurement of equipment for organization of a short-term storage facility of plant genetic resources at the Scientific Production Center of Farming and Plant Breeding and Krasnovodopad Breeding Station of the Ministry of Agriculture of Kazakhstan, where valuable collections of agricultural crops are now stored in safety.

In 2008, by the Decree of the President of the country, Nazarbaev N.A., for the establishment of modern centralized system for conservation of plant and animal genetic resources in Kazakhstan, the construction of the National gene bank of plant and animal genetic resources has been initiated in Almaty. The gene bank will be a modern scientific complex, furnished with the newest equipment and technologies, oriented in future for storage of plant samples from basic and active seeds collections, in vitro collection, cryo-conservation of seed and embryos of animals. The complex will be complemented with a hotel, conference-hall, greenhouse complex and other important facilities. Significant

Dr. Raj Paroda, the then Regional Coordinator of ICARDA, and Prof. Ombayev. Director, South-Western Scientific Production Center, and Dr. Suleimenov, then consultant scientist, ICARDA-CAC, opening the gene bank in Krasniy Vodopad

Dr. Esimbekova, head of Genebank (first from right), Dr. Malhotra, Consultant, ICARDA (second from right), Dr. Kenenbaev, Director General of Scientific Production Center of Crop Husbantry (third from left) and other staff of the Center in Genebank

consultative assistance at project preparation phase has been provided by CIMMYT (Dr. A. Morgunov, Prof. M. Karabaev), ICARDA (Drs. R. Paroda, K. Street, Z. Khalikulov, Y. Konopka), Bioversity International (Drs. J. Ayad, M. Turdieva), and the Nordic Gene Bank (Dr. Bent Skovmand). Study visits to gene banks in Syria, India, Mexico, and USA have been organized.

Several collection missions were organized jointly with ICARDA and CIMMYT:

- under ICARDA/ACIAR project on «Plant Genetic Resources Conservation, Documentation and Utilization in CAC», three expeditions was organized to collect accessions of wild species of cereals, food and fodder legumes in Kazakhstan and Kyrgyzstan with participation of scientists from ICARDA, Russia, Uzbekistan, Kyrgyzstan. As a result, 339 samples were collected in 2000, 116 samples were collected in 2002, and 310 samples were collected 2003;
- in 2003, 49 populations of wild species of cereals from 16 administrative regions of Eastern and South-Eastern Kazakhstan were studied and 144 accessions of 28 types and 14 families of plants

were collected by the scientists of the Scientific-Production Center of Farming and Plant Breeding of the Ministry of Agriculture of Kazakhstan and the Institute of Botany and Phytointroduction of the Ministry of Health of Kazakhstan, under the CIMMYT/ICAR project on "Study of plants of Kazakhstan, collection of genetic resources of cereal crops for breeding improvement";

Route of the expedition in 2004

- in 2004, under the project "Development and improvement of gene resources of cereal crops", 133 accessions of 126 wild landraces of grasses, 37 types, 17 families including Avena, Agropyron, Elytrigia, Helictotrichon, Hordeum, Leymus, Psathyrostachys, Elymus, Setaria were collected from 45 locations together with scientists from ICARDA, CIMMYT, and GTZ in Almaty, Karaganda, Eastern-Kazakhstan and Jambyl regions.

In August, 2004, the Ministry of Agriculture of Kazakhstan, together with CIMMYT, GTZ, and ICARDA, organized a large scientific forum entitled "Development of key directions of agricultural science in Kazakhstan, breeding, biotechnology, and genetic resources". Representatives and scientist from 20 countries of the world participated in the conference. As a result, strategies for development breeding, biotechnologies, plant and animal genetic resources were developed.

NATURAL RESOURCES MANAGEMENT

Machinery development for conservation agriculture

One of the most important and often forgotten elements for successful natural resource management is the provision of adequate machinery. Under the collaboration of Scientific Production Center of Mechanization and Electrification of Agriculture and CIMMYT, a project on "Manufacturing and adaptation of raised bed planter SG-2,8" was implemented in 2004. Five planters have been produced according to this prototype: one unit was sent to Uzbekistan, one unit to Kyrgyzstan, three units to the cooperative farms "Svetlana" and "Gylym" in Kazakhstan. This machine is used for planting winter wheat and soybean on raised beds. It makes irrigation furrows during planting and also forms beds. Moreover, it directly plants winter wheat into the non-processed beds. After planting, it can be re-equipped as cultivator for inter-row cultivation of crops with the inter-row spacing of 70 cm. The raised bed planter can be used on all types of soils in all regions cultivating winter wheat and soybean on raised beds.

Modified planter of «DASMESH» company

It can also be pulled by tractors of 14-20 h/p. Thanks to the combination of planting and bed formation in one machine, a high technical and economic performance can be achieved through decreasing investment costs by 24.5 %, operational costs by up to 32.3 %, labor costs by up to 44.4 %, and fuel costs by up to 31.6 %, as compared to similar machinery. SG-2,8 is patented in Kazakhstan. Developmental prototypes passed numerous domestic and inspection tests.

Also, with support of CIMMYT the procedure of using permanent beds for receiving two harvests has been implemented. The use of the SG-2,8 allows receiving two yields with one bed formation. Such a technology has been adopted in Almaty region in the "Umberaly" cooperative partnership and in the "Svetlana" collective holding.

A number of research activities on water management were also conducted jointly with CIMMYT:

- Resource conserving technology of winter wheat cultivation using biostimulants and manure at irrigation (2003): as a result, recommendations on resource conserving technologies of winter wheat cultivation to achieve the economy of water and energy resources by 13 – 15% and increased productivity of winter wheat by 24% were developed;
- Methods of increasing wheat productivity on alkaline irrigated lands (2003).

Dr. Frants Vyshpolsky, Senior scientist from Kazakh National Water Management Institute (Taraz), is satisfied with the results of phosphogypsum application in magnesium-rich soils of Arys Turkestan, Kazakhstan.

The joint studies of the Research Institute of Water Management and ICARDA on improved furrow irrigation and raised bed planting (2004 – 2007), under the ADB-funded project on "Soil and Water Management" showed that application of cutback irrigation under winter wheat cultivation was more effective together with application of mineral fertilizers. On demonstration plots (19.5 ha and 32.4 ha) the productivity of winter wheat under raised bed planting made up 4.95 – 5.13 t/ha, and under traditional planting by broadcasting it was 2.35-2.61 t/ha. At the same time, 35% of irrigation water could be saved compared to the control. The Indian raised bed planter "DASMESH" was modernized and adopted to local soil conditions.

Phosphogypsum application practice was fine-tuned for adoption in magnesium-rich soils of Arys Turkestan area of Southern Kazakhstan. Studies on the use of different rates and timing of phosphogypsum application on cotton showed that maximum yield (70% higher than control) was attained when 8.0 t/ha of phosphogypsum was applied during fall-winter period.

Under the joint IWMI-ICARDA-ICBA project on "Enabling Communities in the Aral Sea Basin to Combat Land and Water Resource Degradation Trough the Creation of "Bright Spots" (2005-2007), resource conserving technologies were developed for saline lands of Southern Kazakhstan. At Ikan village of Southern Kazakhstan, the "Farmer Alliance" on adoption of phosphogypsum use was established. Socioeconomists from the Research Institute of Water Management received several trainings. The socioeconomic evaluation of promising technologies revealed that cotton yields could be increased by 30-50% in years with good water availability and by 70-100% in dry years, as compared to traditional practice without phosphogypsum application. Similarly, the yields of winter wheat increased by 25-30 % and 30-40%, respectively. Several manuals, recommendations and brochures were developed for farmers on improved irrigation technologies, phosphogypsum application, and "bright spots" characteristics.

Under joint studies with Scientific-Production Center of Farming and Plant Breeding (Prof. A.K. Kireev) and ICARDA in 2002-2006, constraints limiting the wide scale application of zero till were identified (increased weed infestation of crops, increase of density of soil texture). Direct sowing was practiced under barley cultivation. The most feasible diversification crops for rainfed areas were identified. Reduced tillage under fallow and winter was researched.
A research on bed-furrow technology of cultivating highly productive winter wheat varieties in irrigated areas of South-Eastern Kazakhstan was carried out together with CIMMYT. A combined unit for raised bed planting has been created.

Use of treated waster waters for growing trees

Studies on the use of soil protective (zero-till) technologies for sustainable agricultural production were conducted under a two-year Kazakhstan-FAO-CIMMYT project at 4 farms in Northern Kazakhstan. The studies clearly indentified the advantages of resource conserving technologies. It is planned to initiate similar projects in Southern Kazakhstan in 2008.

As a result, and thanks to the tireless efforts of the Ministry of Agriculture of Kazakhstan, national scientists, local administrations and international centers, the area under conservation agriculture practices (reduced and zero till) increased from 1.0 mln ha in 2003 to 5.2 mln ha in 2007.

Water resource management

Only 46% of water resources used in the country are formed in Kazakhstan, the remaining 54% of water comes from trans-boundary sources. Therefore the rational use of water resources is one of the main tasks in agriculture. In this regard, the use of international experiences is very important.

Research Institute of Water Management, together with CG centers, carries out activities on land improvement and irrigation. Joint research activities with ICARDA on "Technology of irrigation and desalinization of irrigated lands in the region of Arys-Turkestan channel" (1999-2002) allowed significantly increasing the productivity of cotton. New norms of water-salt balance were determined. A socio-economic assessment of the efficiency of irrigation and desalinization technologies in the region of Arys-Turkestan irrigation area was elaborated. Regional training courses on "Regimes of irrigation of agricultural crops, water and salt management for sustainable agricultural development in Central Asia" were organized.

Simple water saving technologies in Arys Turkestan, Kazakhstan (2002)

Activities on "The use of treated waste water in Almaty for fodder crops production" were implemented jointly with ICARDA in 1999 – 2002. Quality and balance of waste water, absorption of heavy metals with fodder production were determined. One staff member of Research Institute of Water Management attended the training course on "Water management and improvement of efficiency of water use in the dry areas" in Aleppo, Syria in 1999.

In 2003, under collaborative activities with ICARDA on «Utilization of drainage-runoff waters for rice irrigation in lower reaches of the Syrdarya River», the technology was developed on for Kyzylorda region, and recommendations on the irrigation cycle of rice in the lower reaches of the Syrdarya River were made.

Technologies of water saving and reanimation of unproductive irrigated lands region were developed together with ICARDA in Southern Kazakhstan in 2003-2004. It was demonstrated that water saving technologies reduce technological losses and increase the productivity of agricultural crops. Based on the results, recommendations were published in 2004. Staff members of the Research Institute of Water Management completed trainings on "Biological farming", "Biotechnological melioration of saline lands: principles and application for the regions of Central Asia and the Caucasus", a seminar on adoption of the new cotton variety "Gerda", and a training on "Water management and improvement of water use efficiency in the dry regions" in Aleppo, Syria, in 2004.

Recommendations on application of water saving technologies for wheat cultivation by small farmers using raised bed planting were developed together with ICARDA under the research activity on "Water saving technology of wheat cultivation using method of bed planting" (2003-2004). Socio-economic evaluation of adoption of innovative technologies was done in 2003-2004 under "Research on socio-

economic and legal aspects of water saving technologies adoption in Kazakhstan" (2003-2004).

A project on "Improvement of Water Resources Management in the Water User Associations (WUAs) in the South Kazakhstan" was implemented by IWMI in partnership with Southern Region Water Management Organization of the Water Resources Department of Kazakhstan, WUA Support Program in the Southern Kazakhstan, and South Kazakhstan Farmers Resource Center in Jetisay in 2005-2006.

Assessing the current state of irrigation-drainage networks

The primary goal of the project was to assess the water management issues in WUAs in South Kazakhstan and contribute to the capacity building initiative by providing comprehensive training on water management. This project's achievements are:

1. assessed the technical conditions of the Irrigation and Drainage network of specified WUAs and main canals to better address the issues along the training activities;
2. conducted the water users survey to reflect user perceptions in the design of the training modules;
3. developed a set of training modules based on technical and socio-economic surveys with focus on water management issues within WUAs;
4. conducted training in 25 WUAs on water management aspects related to them, specifically on issues of crop water requirements, water measuring, development of water use plans, water distribution methods, and performance assessment.
5. post-project impact assessment showed that over 30 WUAs, covering over 24,500 ha of irrigated land in Southern Kazakhstan, now develop their own water allocation plans, have adopted water rotational schedules and increased user participation in management and governance;
6. there are signs of better and effective water use within WUAs, which indirectly contributed for water productivity increase by 15%.

Another IWMI project on "Adoption of Best Practices for Water Conservation in the Syrdarya and Amudarya River Basins" was conducted in Southern-Kazakhstan and Kyzylorda provinces of Kazakhstan in 2001-2003 though funding from the World Bank. This project was implemented in partnership with the Scientific Information Center of the Interstate Commission for Water Coordination for Central Asia (SIC-ICWC) and national partners.

IWMI researchers collecting feedback from farmers during water users survey

The project selected and undertook monitoring of 16 field-indicators in the above-mentioned provinces. Water management organizations, Water User Associations, collective/cooperative farms, and private farms were assessed and analyzed with reference to water conservation in irrigated agriculture.

Within the framework of the Project, primary methods to improve the water use efficiency at all levels were identified and classified. Enabling factors for application of these

methods were analyzed. In addition, project organized relevant workshops to disseminate water conservation practices.

LIVESTOCK AND FEED PRODUCTION

ICARDA implemented an IFAD project on "Integrated fodder and livestock production in steppes of Central Asia" in 1999-2003 in Kazakhstan together with the Scientific Production Center of Livestock Breeding and Veterinary and the South-Western Scientific Production Center of Agriculture in 15 farms in Almaty and Southern Kazakhstan regions. Under the project, the activities on improvement of vegetative cover by plant grass species, seed production of wild arid fodder species, adoption of pasture rotation, development and adoption of balanced feeding technologies, feed blocks, early weaning and early lambing were carried out. A center for artificial insemination of sheep was organized including of 2.5-3.0 thousand yews in 8-10 farms. Farmers were trained on basic principles of agricultural engineering and adoption of fodder production. Computers and other equipment were also provided.

Kazakh farmers are happy with new livestock production technologies

These research activities are being continued under the second phase of the project entitled "Community Action in Integrated and Market Oriented Feed-Livestock Production in Central and South Asia Project" (2006 - 2009), which includes socioeconomic studies, research on pasture productivity and fodder production, and livestock breeding.

SOCIOECONOMIC AND POLICY RESEARCH

The Institute of Integrated Economic Research in the Agricultural Sector in Almaty has been involved in several joint research activities with CG Centers since 1998.

A project on "Increasing the competitiveness, sustainability, profitability and productivity of the cereal sector of Kazakhstan" (Grant IDF of the World Bank # 27224 KZ) was conducted together with CIMMYT. Under this project, the process of agricultural re-organization in the country was analyzed and constraints to agricultural development such as low production intensity, high production risks and insufficient financial independence were identified.

Based on the field work, an assessment of wheat competitiveness has been conducted with emphasis on increasing the profitability of farming units. Factors restricting the development and adaption to market conditions (disorganization of the production and marketing channels, irrational use of resources, insufficient capital investment, and absence of normative and forecasting bases) have been determined. Sources and mechanisms to increase wheat yields and productivity and possibilities for future enhancement of exports have been identified, including increase in the soil fertility and cultivar diversity, improvement of agricultural practices and use of less intensive technologies, increase in the productivity of machinery, development of marketing services and regulation of grain transportation, and shift to long-term wheat storage to ensure the stable supply of wheat to end users. A publication on "Mechanisms of Grain Supply and distribution in Kazakhstan" was produced by Drs. G.Nikitina and J. Rolobaev. The Project on "Assessment of the modern status of the agricultural economy and the system of agrarian research, education and knowledge dissemination in Kazakhstan and development of the national strategy of reforms" has been implemented under a World Bank grant together with

CIMMYT and ISNAR. The analysis of the quantity of livestock and poultry in 1991-2000, areas planted under various agricultural crops was conducted. Major factors restricting the development of agriculture were determined; the analysis of the import of certain goods (meat, milk, butter, seed oil, potato, fruits and berries, sugar, bread) from different countries of the world were carried out. One publication on wheat competitiveness in Kazakhstan was published by A.B. Moldashev and Zim Longmire.

Together with ICARDA, the research on evaluation of market potential, sales channels and market constrains was carried out. The market potential for agricultural products, in particular the livestock products (milk, meat and wool market), was assessed for the period of 1991-1998; the assessment of the marketing channels of livestock products from farms of different forms of ownership was conducted for the period of 1991-1998; the analysis of the selling prices for livestock products via different channels was conducted in Almaty, Jambyl and other provinces of Kazakhstan. Factors contributing to the decrease in the price risk and market development were identified and possible options for creating cooperative units for storage and processing of the livestock products (milk, meat, etc.) were recommended.

Under the joint study with CIMMYT on "Regional aid net for poor farmers", farmers and specialists of seed production farms of three pilot regions in southern provinces of Kazakhstan were interviewed. As a result, factors restraining development of farm holdings were found, which led to identification of characteristics and level of household welfare and selection of farmers that were in need of support. Several publications were produced.

Socioeconomists from Kazakh Water Management Institute and ICARDA are conducting a livelihoods survey

With support of an UNEP-GEF project on "In situ/on farm preservation and use of agrobiodiversity (fruit crops and their wild species) in Central Asia", implemented by Bioversity International, the analysis of legal and normative acts for development of farms specialized in fruit production was conducted. A Regional Training Center on socio-economic issues was organized in the Institute, where seminars with the participation of specialists from 5 counties of Central Asia are carried out.

In addition, from 2000-2007, researchers from the National Water Management Institute of Kazakhstan conducted a series of socioeconomic studies together with their ICARDA colleagues under the projects on "Soil and Water Management" and "Bright Spots" on evaluation of promising technologies developed under these projects and livelihoods surveys to identify the living conditions of rural populations as well as the existing potential, constraints and opportunities for adoption of new technologies.

CAPACITY BUILDING

Development of human resources is one of the most important aspects of the CGIAR-CAC Program activities in Kazakhstan.

Since 1998, a total of 3,548 scientists, farmers and research administrators from Kazakhstan participated in various capacity building events such international conferences, seminars, trainings, study programs organized by Consortium members (Table 2). In addition to this, more than 50 young scientists from Kazakhstan improved their knowledge of English language in the English language courses organized by the program.

Table 2: CG-supported capacity building efforts in Kazakhstan since 1998

Activities	Total events	Number of participants
Farmer fields days	35	2,711
Conferences and workshops	43	304
Training programs	66	533
Total	144	3,548

Field day in Shortandy, Kazakhstan, 2006

Farmers' field day in Arys Turkestan in 2007

In addition to trainings, various equipments such as raised bed planters, optical sensors for biomass measurement, freezers, computers and other research tools and implements were provided.

PUBLICATIONS

As a result of joint collaboration between NARS scientists of Kazakhstan and their colleagues from international centers, close to 100 publications were produced during these ten years. These publications included scientific articles, guidelines and brochures, leaflets and manuals, policy briefs and newsletters. Some few examples of joint publications in refereed journals and book chapters are given below:

- *Vyshpolskiy F., M. Qadir, A. Karimov, K. Mukhamedjanov, U. Bekbaev, R. Paroda, A. Aw-Hassan and F. Karajeh, 2008. Enhancing the Productivity of High-Magnesium Soil and Water Resources in Central Asia through the Application of Phosphogypsum. Land Degradation & Development. 19(1). p.45.*
- *Morgounov A., H. Gómez-Becerra, A. Abugalieva, M. Djunusova, M. Yessimbekova, H. Muminjanov, Yu. Zelenskiy, L. Ozturk, I. Cakmak, 2007. Iron and zinc grain density in common wheat grown in Central Asia. Euphytica, Volume 155, Numbers 1-2, May 2007, pp. 193-203(11)*
- *Trethowan R., A. Morgounov, He. Zhonghu, R. Pauw, J. Crossa, M. Warburton, A.Baytasov, Ch.Zhang, M.Mergoun, G.Alvarodo, 2006. The global adaptation of bread wheat at high latitudes. Euphytica, Volume 152, Number 3, December 2006 , pp. 303-316(14)*
- *Suleimenov M., 2007. Sow Don't Fallow. Interligal Publishers, Almaty, Kazakhstan. 220 pp. (in Russian).*
- *Karabayev M., N. Yuschenko, A. Akramkhanov, and S. Shpigun, 2007. Forage crops production in dry areas with an allowance for ecological risks. - Methods of seeding and growing of perennial and annual grasses. Astana, Kazakhstan. 112 p.*
- *Suleimenov M., and R. Thomas, 2007. Central Asia: Ecosystems and carbon sequestration challenges. In Lal R., M. Suleimenov, B.A. Stewart, D.O. Hanson, P. Doraiswamy (Eds.), Climate Change and Terrestrial Carbon Sequestration in Central Asia (pp. 165-177). Taylor & Francis Group, London, UK.*
- *Saparov A., K. Pachikin, O. Erokhina, R. Nasyrov, 2007. Dynamics of soils carbon and recommendations on effective sequestration of carbon in the steppe zone of Kazakhstan. In Lal R., M. Suleimenov, B.A. Stewart, D.O. Hanson, P. Doraiswamy (Eds.), Climate Change and Terrestrial Carbon Sequestration in Central Asia (pp. 177-189). Taylor & Francis Group, London, UK.*

Starting from 2005, a new regional peer-reviewed scientific journal “Agromeridian” is being published with joint efforts of CIMMYT and ICARDA. The journal, distributed mainly among Central Asia and the Caucasus countries, and Russia, is an important source of valuable information for the plant breeders, geneticists, seed producers, agronomists, and other specialists in CAC to improve wheat varieties, grain quality and crop yields in this region. If during its first years, the publication of “Agromeridian” was supported by the World Bank, it is very encouraging that now the Government of Kazakhstan is actively supporting the publication of this highly important journal.

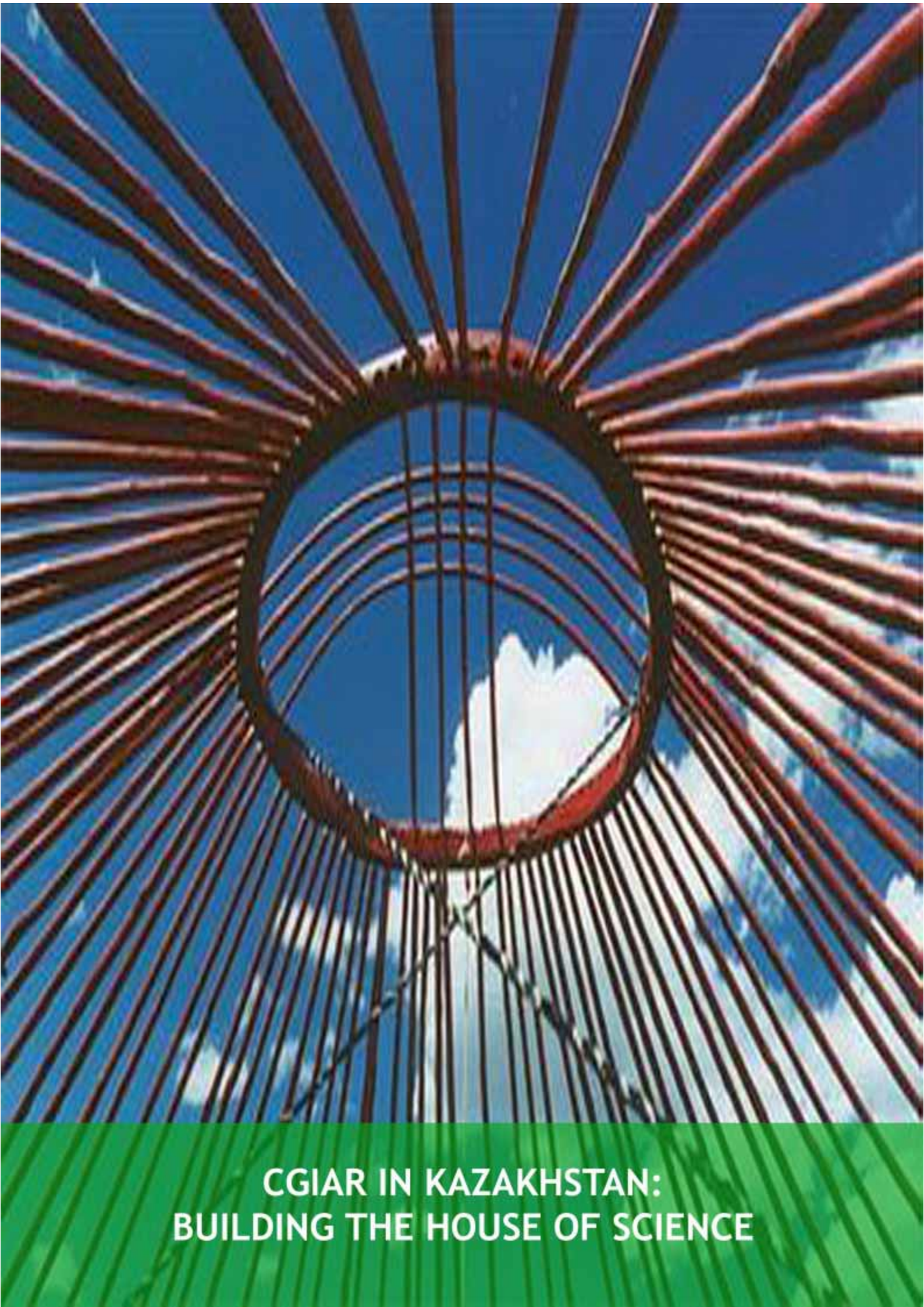
The activities of the CAC Program in Kazakhstan are also constantly covered in the quarterly newsletter of the Program “CAC NEWS” published by PFU. So far, 35 issues of this newsletter have been produced and widely disseminated among CAC countries and international partners. In addition, the Program website at: www.icarda.org/cac also maintains the most recently updated information on the Program's activities in Kazakhstan.

STRENGTHENING OF CGIAR-KAZAKHSTAN PARTNERSHIP

The CGIAR System-wide Program for CAC has made a good beginning during this first decade. A strong partnership for developing agricultural research has been built among CG Centers, ARIs and Kazakhstan. All this was possible thanks to a bottom-up approach and partnership philosophy in collaborative research, aimed at strengthening national research organizations and management, development of human resources and establishment of research networks.

Acad. Kurishbaev, Minister of Agriculture, Kazakhstan, chairing the meeting on future collaboration with CGIAR CAC program and Kazakhstan (March, 2008).

It is envisaged that the partnership of CG Centers and Kazakhstan in the future is based on the needs of Kazakh farmers to increase the production and quality of agricultural crops and livestock through efficient and sustainable technologies. The partnership established over the last ten years has proven to be successful. The Consortium partners are fully committed to strengthen and further expand their partnerships with research institutes, universities, civil society and the private sector in Kazakhstan.



CGIAR IN KAZAKHSTAN: BUILDING THE HOUSE OF SCIENCE