

TIES THAT BIND, No. 1

The United States and ICARDA



International Center for Agricultural Research in the Dry Areas

ICARDA's Mission

Established in 1977, the International Center for Agricultural Research in the Dry Areas (ICARDA) is governed by an independent Board of Trustees. Based at Aleppo, Syria, it is one of 18 centers supported by the Consultative Group on International Agricultural Research (CGIAR), which is an international group of representatives of donor agencies, eminent agricultural scientists, and institutional administrators from developed and developing countries who guide and support its work.

The CGIAR seeks to enhance and sustain food production and, at the same time, improve socioeconomic conditions of people, through strengthening national research systems in developing countries.

ICARDA focuses its research efforts on areas with a dry summer and where precipitation in winter ranges from 200 to 600 mm. The Center has a world responsibility for the improvement of barley, lentil, and faba bean, and a regional responsibility—in West Asia and North Africa—for the improvement of wheat, chickpea, and pasture and forage crops and the associated farming systems. ICARDA also conducts extensive research on small ruminants, mostly sheep.

Much of ICARDA's research is carried out on a 948-hectare farm at its headquarters at Tel Hadya, about 35 km southwest of Aleppo. ICARDA also manages other sites where it tests material under a variety of agroecological conditions in Syria and Lebanon. However, the full scope of ICARDA's activities can be appreciated only when account is taken of the cooperative research carried out with many countries in West Asia and North Africa through the Center's regional programs.

The results of research are transferred through ICARDA's cooperation with national and regional research institutions, with universities and ministries of agriculture, and through the technical assistance and training that the Center provides. A range of training programs are offered extending from residential courses for groups to advanced research opportunities for individuals. These efforts are supported by seminars, publications, and by specialized information services.

The United States has long been recognized as a world leader in agricultural research and development. Pioneers such as Luther Burbank and Norman Borlaug set the standards for modern agricultural science. At the same time, the activism and generosity of the U.S. Government and private foundations in supporting growth and development around the globe has provided the necessary funds to international agricultural research institutes striving to increase agricultural productivity and sustainability, including the centers coordinated by the Consultative Group on International Agricultural Research (CGIAR).

One of those institutes, the International Center for Agricultural Research in the Dry Areas (ICARDA), is located in an area of critical importance to the U.S. ICARDA conducts research in a climate not unlike many areas of the U.S. Like a major portion of the American West, ICARDA's mandated region, West Asia and North Africa, receives low rainfall, and experiences hot, dry summers and cold, moist winters.

Given this climatic similarity, many of the same crops, principally wheat but also barley and forage crops, are grown in both regions. As a result, improved crop varieties and agricultural technologies developed in one area have potential applications in the other.

This brief pamphlet highlights the broad range of ICARDA activities supported by or involving the U.S., and the mutual benefit reaped by the U.S. and ICARDA from this relationship.

West Asia and North Africa: the Challenge

It is becoming increasingly clear that many of the countries of West Asia and North Africa (WANA) may be on the verge of a severe food crisis, brought about by a dangerous combination of unprecedented population growth, lagging agricultural production and resource depletion.

World Bank projections foresee that the region's population will triple between 1990 and 2030, reaching a daunting 1.5 billion. In the meantime, WANA has become the largest food-importing region in the developing world. Agricultural imports account for over 25 percent of the region's total import bill and more than 40 percent of the value of all food imports by the world's developing countries.

If current trends in production and consumption persist, the region will continue to be a deficit area in all important food commodities—cereals, sugar, vegetable oils, meat and milk—for the foreseeable future. The main shortages will be in wheat and barley; between the 1980s and the year 2000, imports will grow from 22 million tonnes to 35 million tonnes of wheat and from 5.5 to 11 million tonnes of barley, representing increases of about 57 percent and 100 percent, respectively. Sheep imports, which have doubled in the last 15 years, now account for 25 percent of the world's trade of this commodity. The annual deficit in all types of meat currently stands at about 1.5 million tonnes and the gap is not expected to be bridged by the year 2000. The International Food Policy Research Institute estimates that, in monetary terms, the deficit in livestock products could grow six-fold during this period.

The region's land resources are both small and fragile. Only about 128 million hectares, or 8 percent of the area's 1.7 billion hectares, is thought to be arable. Another 375 million hectares (22 percent) are permanent pasture. Small areas are used for perennial crops and forests, leaving the bulk of the remaining 70 percent as desert or semi-desert (steppe). Much of the land (40 percent) is at high altitudes and extensive areas have steep slopes and/or shallow, rocky or saline soils that are unsuitable for cultivation without extensive and costly reclamation.

In taking measures to curb imports and boost domestic production, new combinations of policy and technology must be found to increase land and labor productivity without damaging the already fragile environment.

ICARDA's Response

ICARDA's role in addressing these problems is based upon a close working relationship with the region's national agricultural research institutions and excellent contacts with similar bodies in the developed world. Together, they are working to develop practical and sustainable solutions for agriculture in the area's harsh, highly variable environment. ICARDA has adopted a multi-faceted approach involving genetic improvement of its mandated crops (wheat, barley, chickpea, lentil, and forage and pasture crops), research into more efficient and environmentally sound farming practices and small ruminant management, and extensive manpower training.

Since 1977, approximately 40 countries—including the United States—have released close to 200 crop varieties developed with material supplied by ICARDA (see pages 6-7). Over the same period, more than 4,000 scientists and researchers—mostly from the developing world but also from developed countries—participated in ICARDA training activities.

Central to ICARDA's work is an acute awareness of the integrated nature of agriculture in the region: no crop or activity is studied without consideration of the whole farming system. This includes the interrelationship between livestock and crops, local tastes and preferences, the role of hired labor and off-farm work, and other socioeconomic aspects of farming.

The harsh conditions of rainfed agriculture in WANA rule out any short-term, quick-fix solutions. For most of the region's countries, continued massive dependence on costly food imports is simply not a viable option. Increased local production, brought about by the use of improved crop varieties, more efficient and environmentally sound farming methods, sound economic policies, and redoubled investment in training and education, are the key to averting a major food crisis.

The U.S. Dimension

The United States played a critical role in the establishment of ICARDA. Prior to the Center's formal establishment in 1977, the Ford Foundation provided funding for ICARDA's precursor, the Arid Lands Agricultural Development

Program (ALAD), based in Beirut, Lebanon. The program became the nucleus of what was to eventually become ICARDA. Since then, U.S. support has been both generous and consistent.

Since ICARDA's establishment, the United States has been the largest single contributor to ICARDA's budget, providing nearly \$70 million between 1977 and 1991, including \$63.162 million from the U.S. Agency for International Development (USAID). Other important American donors include the Ford Foundation, the Near East Foundation, the Rockefeller Foundation, and American Near East Refugee Aid (ANERA).

In 1991 USAID contributed \$4.576 million to ICARDA's budget, more than any other single donor. The support of private foundations added another \$326,000, bringing the total direct American share to \$4.902 million out of a total budget of \$22.214 million.

The Human Angle

ICARDA's relationship with the United States is not only institutional and financial; it is also human. American scientists have long been pacesetters in ICARDA research, and visiting American scientists and technicians have played an important role in widening contacts between the U.S. and regional scientists. In addition, scores of other ICARDA scientists have obtained their advanced degrees in the United States. On average, two scientists go on sabbatical every year to the United States to conduct research and interact with their colleagues there.

**A recent example of U.S.-ICARDA cooperation at work:
The Story of the Crimson Lentil**

The WANA region is the genetic source of origin of many of the staple crops commonly cultivated throughout the world. It was in WANA that crops such as wheat, barley, lentil, chickpea and others were domesticated. Germplasm collected in these areas often contains valuable genes for resistance to physical stresses such as heat, cold and drought, as well as biological stresses including pests and diseases.

Plant breeders working on these crops therefore depend on rare and potentially useful germplasm from WANA in the development of more productive and stress-resistant varieties.

An excellent example of the benefit reaped by American farmers from ICARDA is the recent release of the "Crimson" lentil (Latin name: *Lens culinaris* Medikus) in Washington and Idaho states. The Crimson lentil is derived from Egyptian germplasm supplied by ICARDA to the U.S. Department of Agriculture and Washington State University.

A recent issue of the American journal *Crop Science* reported that the Crimson lentil has been evaluated as equal to or better than "Redchief," the most commonly grown lentil in eastern Washington State and northern Idaho. Crimson's most salient features are its adaptability to low-rainfall conditions, its early blooming date (essential if the high-temperatures of summer are to be avoided), tall and upright growth habit (important for mechanized harvesting), and good yield. The Crimson lentil "should appeal to international markets," *Crop Science* noted.

The Egyptian variety from which the Crimson lentil derives, Giza-9, is known as a "purified landrace." A landrace is a crop variety characterized by modest yields but good adaptability to local conditions. Farmers traditionally used seed mixtures including several varieties to avoid crop failure. Egyptian researchers identified Giza-9, samples of which were sent for storage in ICARDA's genebank. ICARDA in turn made these samples available to scientists at the University of Washington in Pullman, Washington state. Scientists there found that Giza-9 thrived under the conditions of the area. According to ICARDA lentil breeder Dr William Erskine, the Crimson lentil "is illustrative of the value of research conducted jointly in dry areas such as the Middle East and the western United States."

Lentil is probably one of the first pulse crops to be domesticated in the Fertile Crescent. Carbonized lentil remains, found at Tel Mureybit on the banks of the Euphrates River in northern Syria, date back 10,000 years. The cultivation of lentil spread with Neolithic agriculture to southern Europe and reached Crete by 6000 BC. Lentils were highly esteemed in Pharaonic Egypt; a paste of lentil was found in the Twelfth Dynasty (2400 - 2200 BC) tombs at Thebes.

Traditionally lentil has been credited with a wide range of medicinal properties. Old medical texts report that lentil "thickens the blood," which may refer to its high iron content. In parts of Europe lentil is ground and mixed with barley flour and salt and marketed as food for infants. Lentil is low in fat but rich in carbohydrates, protein, calcium, iron, phosphorus and the B vitamins.

Examples of Special Projects and Activities Supported with American Funds

The brief list below of joint projects and cooperative research activities and scientific exchanges between ICARDA and the United States represents an enduring testimony to the relationship.

American Near East Refugee Aid

Seed Production Cooperative Project in Lebanon: Grant to support seed cooperative in Lebanon.

Ford Foundation

Dryland Resource Management Project: Principal funding for the localized studies by multidisciplinary teams of regional scientists intended to address the agricultural and environmental problems of the drier areas of WANA.

Farming Systems Training: Grant to support research of regional scientists in cooperation with ICARDA, and for workshops.

Agricultural Labor and Technological Change: Grant to enable the employment of a project coordinator at ICARDA and preparation of regional and country reviews of issues relating to agricultural labor and technological change, in addition to special case studies.

Graduate Fellowships: Grant to augment ICARDA's own program of graduate fellowships.

Supplementary Irrigation: Grant to cover the cost of

national consultants and their technical support.

Post-Doctoral Fellowships: Grant to support graduate and post-doctoral fellowship programs in agricultural research for Middle Eastern and North African students.

Wild and Cultivated Species: This project, in collaboration with four Italian institutions, seeks to combine resistance to two plant diseases (*Ascochyta* blight and *Fusarium* wilt), identify races of *Ascochyta rabiei* in the Mediterranean region, and exploit annual wild species for chickpea improvement.

Enhancing Wheat Productivity in Stress Environments Utilizing Wild Progenitors and Primitive Forms: Collaborative project with the University of Tuscia, Italy, to study the genetic variability in the wild progenitors and primitive forms of wheat, identify desirable wheat germplasm, and train regional scientists.

Near East Foundation

Fertilizer in Dryland Barley/Livestock Systems: Grant to support the joint program of ICARDA with the Soils Directorate of the Syrian Ministry of Agriculture and Agrarian Reform.

Rockefeller Foundation

Social Science Research Fellowship: Grant to support research on adoption and impact of technology.

United States Agency for International Development

MART/AZRI Project, Baluchistan: Since 1985 ICARDA has been contracted by USAID for a component of its Management of Agricultural Research and Technology (MART) project. The project is intended to strengthen Pakistan's Arid Zone Research Institute (AZRI) and assist in the development of a research program for improving agricultural production in harsh high-elevation climates. This project participates in research on rangeland-livestock systems, water harvesting, and soil. Its principal purpose, however, is institution-building.

Barley Pathology. Research in the epidemiology, virulence and resistance of pathogens of importance to barley cultivation in West Asia and North Africa.

USAID-funded cooperative research projects with U.S. institutions

Mid-America International Agricultural Consortium Screening Wheat and Barley for Resistance to Hessian Fly.

Differential nurseries containing the known resistance genes for Hessian fly are planted in six countries, with annual surveys in the Maghreb countries (Morocco, Algeria and Tunisia).

Montana State University

*Project on barley diseases and breeding methodology,
including graduate studies.*

University of Utah

*Project on C-13 discrimination as an indicator of drought
tolerance.*

**Washington State University and University of
Idaho**

*Project to incorporate Bt-gene into lentils to control Sitona
weevil.*

Collaborative Projects with U.S. Universities

Michigan State University

*Follow-up study on ICARDA training activities.
Development of barley growth models.
Fertilizer allocation and import in Syria.*

Oregon, Montana and Kansas State Universities

*Development of cereal germplasm for stress
environments.*

Oklahoma State University

*Collection and introduction into the U.S. of parasites to
combat Russian Wheat Aphid.*

Texas A&M

Analysis of barley and livestock prices in Syria.

University of Georgia

Cooperative research on cereal rust disease.

University of Massachusetts

Nutrition and dietary patterns in rural Syria (partially supported by the Ford Foundation).

University of Nebraska

Multivariate analysis of legume/pasture research.

Stanford University

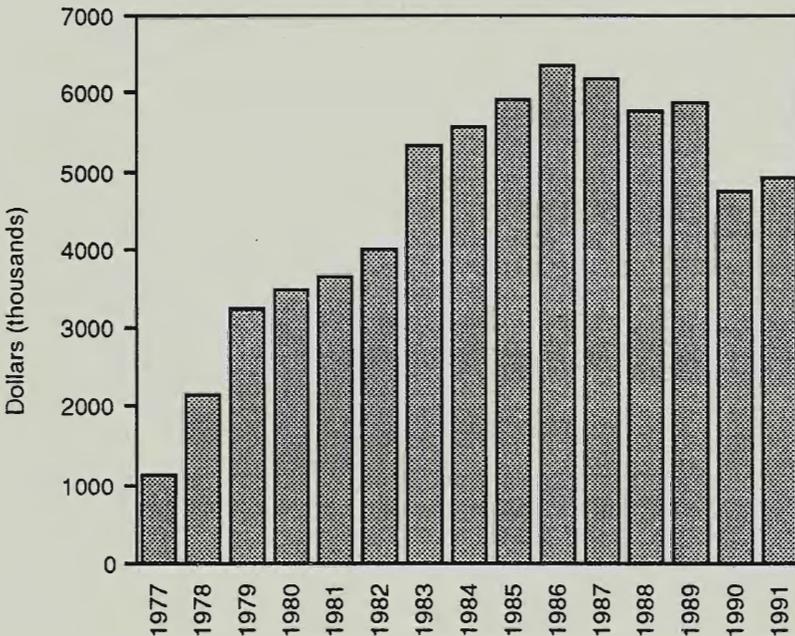
Joint research on economic optimization of N fertilizer use on wheat and barley.

Washington State University

Study of alternate approaches to water-use efficiency research.

Located in an important center of genetic origin and bringing together the varied talents of scientists from the U.S. and other countries, ICARDA is ideally suited to serve beneficiary and donor countries alike, as was graphically illustrated in the case of the Crimson lentil. In a shrinking world, the interdependence of the developed and developing world is becoming ever more apparent. ICARDA, a synthesis of both worlds, will have a vital role to play over the coming years.

**U.S. Contributions to ICARDA's Annual Budget
1977-1991**



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