
Germany and ICARDA

Ties that Bind

The International Center for Agricultural Research in the Dry Areas

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**International Center for Agricultural
Research in the Dry Areas**

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About ICARDA and the CGIAR



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 16 centers supported by the Consultative Group on International Agricultural Research (CGIAR).

ICARDA serves the entire developing world for the improvement of lentil, barley and faba bean; all dry-area developing countries for the improvement of on-farm water-use efficiency, rangeland and small-ruminant production; and the West and Central Asia and North Africa region for the improvement of bread and durum wheats, chickpea, and farming systems. ICARDA's research provides global benefits of poverty alleviation through productivity improvements integrated with sustainable natural-resource management practices. ICARDA meets this challenge through research, training, and dissemination of information in partnership with the national agricultural research and development systems.

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 is offered extending from residential courses for groups to advanced research opportunities for individuals. These efforts are supported by seminars, publications, and specialized information services.



The CGIAR 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 receives support from a wide variety of country and institutional members worldwide. Since its foundation in 1971, it has brought together many of the world's leading scientists and agricultural researchers in a unique South-North partnership to reduce poverty and hunger.

The mission of the CGIAR is to promote sustainable agriculture to alleviate poverty and hunger and achieve food security in developing countries. The CGIAR conducts strategic and applied research, with its products being international public goods, and focuses its research agenda on problem-solving through interdisciplinary programs implemented by one or more of its international centers, in collaboration with a full range of partners. Such programs concentrate on increasing productivity, protecting the environment, saving biodiversity, improving policies, and contributing to strengthening agricultural research in developing countries.

The World Bank, the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), and the United Nations Environment Programme (UNEP) are cosponsors of the CGIAR. The World Bank provides the CGIAR System with a Secretariat in Washington, DC. A Technical Advisory Committee, with its Secretariat at FAO in Rome, assists the System in the development of its research program.

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No. 13



**International Center for Agricultural
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Partners who care

Germany possesses one of the world's leading industrialized economies and has for many years been actively funding overseas development projects through the annual allocation of many millions of Deutschmarks.

An early member of the Consultative Group on International Agricultural Research (CGIAR), Germany's representatives have always taken a vigorous and influential part in the Group's discussions. When the proposal to set up a new international research center for the dry areas of the world was first mooted in the 1970s, Germany was deeply involved in the discussion process.

At the first meeting of the CGIAR sub-committee in February 1975 in Rome, which led to the formation of the International Center for Agricultural Research in the Dry Areas (ICARDA), Germany was represented by Mr H. Schmidt-Burr. When Germany subsequently became one of the first contributors to the trust fund which financed the setting up of ICARDA, it marked the start of a partnership that continues more than 25 years later into the second millennium.

Like all partnerships, there have been mutual benefits drawn from the relationship which have enriched the understanding of both parties but above all the relationship has resulted in a worthwhile and lasting contribution to the alleviation of poverty in the world's extensive dry areas.

The German Federal Ministry for Economic Cooperation and Development (BMZ) considers agricultural research to be an important strategic tool for development towards increasing food security, alleviating poverty, and improving the management and sustainable use of natural resources in developing countries. The main objective of the BMZ in funding international agricultural research is to develop innovations with potential impact focusing on the poor in developing countries. This includes policy, social, environmental as well as technological dimensions of research, training professionals and disseminating information.

Funding is provided for the Consultative Group on International Agricultural Research (CGIAR) and affiliated international agricultural research centers (IARCs), including ICARDA. This comprises core contributions as well as targeted funding of short- and medium-term research activities. The BMZ submits project proposals for peer review and assessment to the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) and the Beratungsgruppe für Entwicklungsorientierte Agrarforschung (BEAF).

ICARDA and the other IARCs are part of a global research system for development which includes National Agricultural Research Systems (NARS) in developing countries as well as Advanced Research Organizations (AROs), mostly located in industrialized countries. Joint research activities of IARCs, AROs and NARS facilitate the transfer of advanced technologies to developing countries helping to sustain the resources, accelerate innovations and open new development opportunities for the ultimate beneficiaries.

The NARS are the primary partners of ICARDA and the other IARCs in research collaboration, capacity building and the dissemination of information. However, cooperation with AROs, particularly those in Germany, provides ICARDA with access to specialized research capacity which enables the rapid transfer of appropriate new technologies both to ICARDA and to the countries within the Center's mandate region. In this respect, Germany and its advanced institutions play a vital role, and the contribution of German scientists has been significant either as staff members at ICARDA or through collaboration with the Center.

Germany and ICARDA

Board of Trustees

The contribution of German scientists to the success of ICARDA in maintaining a targeted research program serving the dry areas

has been underlined by their involvement with the Center's Board of Trustees.

Currently serving on the ICARDA Board until 2002 is Dr Peter Frank-Oberaspach, who is Vice President of the Advisory Committee of BAZ (Federal Center for Plant Breeding Research) and Senior Executive of Pflanzenzucht Oberlimpurg, Schwäbisch Hall.

Dr Winfried von Urff, Professor of Agricultural Policy at the Technical University of Munich's Faculty of Agriculture and Horticulture, was a Board Member from 1988-94 during which period he brought to ICARDA a wealth of experience and expertise in the field of agricultural development.

Animal Scientist Dr Ekkehard Clemens, from the GTZ, served on the Board from 1981-86, and was Chair of the ICARDA Board from 1985 to 1986.

Research Collaboration and Achievements

The impact of the scientific work, funded by Germany, at ICARDA and collaborating institutions has been considerable since the 1970s and will continue for many years to come as new crop varieties or technologies flowing from this support are adopted by resource-poor farmers. In addition, the young scientists and technicians, who have benefited in training and in experience from the collaboration, will continue the fight against poverty thanks to the initial impetus their work received from Germany and ICARDA.

To judge just how important Germany is to the transfer of scientific understanding that eventually benefits the rural poor, it is necessary only to look at the example of the biotechnology research supported by Germany at ICARDA. It is anticipated that biotechnology will make an immense contribution to the alleviation of poverty. With the financial support of Germany, and with access to the cutting edge expertise of its biotechnology scientists, the dry area countries are not to be excluded from this particular revolution in plant science.

Biotechnology to benefit all

Three major avenues in biotechnology are now followed by ICARDA—*in vitro* culture, molecular characterization and transformation technologies. That the Center's Germplasm Program was able to establish itself early in this branch of science was in large part thanks to the cooperation with Germany. More importantly, as a result of this initial ICARDA/Germany collaboration, the NARS in the Center's mandate region are now in turn getting early access to biotechnologies which will speed up the processes for them of getting improved crop cultivars into use by farmers.

Egypt, which in 2000 is conducting trials with ICARDA plant material derived from the use of biotechnology tools, is the only country in WANA at present with a working biosafety regulatory system. Thanks to the expertise now in place at ICARDA, the Center is working closely with a number of other countries in the region—including Algeria, Lebanon, Morocco, Palestine, Syria and Tunisia—to help them establish suitable biosafety regulations to allow full use of biotechnology in the future. This is being done in collaboration with Egypt's Agricultural Genetic Engineering Research Institute (AGERI) and the FAO.

ICARDA's biotechnology work, which was first led by Senior Biotechnologist Dr Franz Weigand and currently by Senior Biotechnologist Dr Michael Baum, both from Germany, aims to support ICARDA's crop improvement objective of providing NARS with well targeted biotic and abiotic stress tolerant cultivars and genetic stocks. Much of ICARDA's biotechnology provides support through the evaluation, adaptation and, finally, the application of novel genome analysis techniques (DNA-marker technology). This will provide ICARDA and NARS scientists with new tools to establish more efficient and effective selection schemes for crop improvement. This approach is applied to crops as well as to corresponding pathogens, viruses and pests, and should ultimately lead to a more efficient and effective use of existing genetic variability in ICARDA mandate crops.

Food security is stated as a policy objective in many countries in WANA, to be achieved through investment in domestic agriculture. New crop varieties are an example of cheap, easy, and environmentally-compatible improved production technology that is scale-neutral. They can be easily adopted by farmers and readily fit into the existing production system without the need for additional inputs.

The conventional empirical selection strategy applied by plant breeders involves repeated cycles of selection for agronomic performance and stress resistance combined with multilocation testing. As breeders strive to improve germplasm and extend the range of adaptation, the number of traits that must be incorporated into new cultivars increases. Each new trait requires expertise in developing appropriate identification and screening procedures. The simultaneous or sequential screening for multiple biotic or abiotic stresses may be impractical or impossible. Molecular biology and tissue culture offer a range of techniques that can help to increase the efficiency of crop production systems when integrated in crop improvement schemes.

In 1996, a significant step forward in achieving such aims for ICARDA and for the NARS was taken when the BMZ agreed to fund with DM 1.9 million a new project on DNA Marker-Assisted Breeding and Genetic Engineering of ICARDA Mandated Crops.

The joint themes of this three-year project were:

- (a) Assuring sustainable and resource conserving productivity growth of main food crops with regional significance.
- (b) Protecting the biological diversity of genetic resources; identification of genetic characteristics using biotechnological methods.

It set out to establish a system for marker-assisted germplasm selection and the estimation of genetic diversity in ICARDA's mandated crops, the identification and characterization of pathogens, viruses and pests and increased genetic variability through the use of biotechnology tools and tissue culture technology.

Collaborating institutes were:

- Plant Molecular Biology Biocentre, University of Frankfurt,

Frankfurt am Main (Prof. Dr. G. Kahl)

- Department of Molecular Genetics, University of Hannover (Prof. Dr. H-J. Jacobsen)

The funding of the project by BMZ permitted the financing for the project duration of a senior biotechnologist at ICARDA, a Visiting Scientist, three Post-doctoral Fellows, three Research Associates, and two Research Assistants

What were the benefits?

During the project, a number of methodologies were developed which are available for further research applications:

Sequence-tagged-microsatellite sites (STMS) markers were developed in chickpea. These were made available to all other groups working on chickpea in India, the USA, Canada and Australia.

A regeneration and transformation system for chickpea is now available. Genes of choice can be introduced into cultivated chickpea to meet a number of existing aims, including resistance to *Ascochyta* blight.

Gene tags (RAPD markers) for *Fusarium* wilt resistance and radiation frost tolerance in lentil were developed.

A protocol was developed to perform interspecific crosses in chickpea successfully.

RAPD markers were identified that can distinguish the three virulent pathotypes of chickpea *Ascochyta* blight fungus (*Ascochyta rabiei*) in the WANA region.

Second phase

As a result of these successes, which pave the way to easier development of new chickpea and lentil varieties with desirable characteristics, the BMZ agreed to further extend the project into a second three-year phase. This time an additional partner—the Agricultural Genetic Engineering Research Institute (AGERI) from Giza, Egypt—has been brought in to further enhance the transfer of knowledge and expertise to the dry areas. A further injection of DM 1.9

million means that three Post-doctoral Fellows, two Research Associates, a Research Fellow, and a Research Assistant are being financed.

Early results from this phase are continuing to build on the original work. At ICARDA a number of crosses in chickpea for resistance to *Ascochyta* blight, cold and nematodes have been made; 10 chickpea lines developed using biotechnology will be tested at AGERI; and the development of STMS markers for lentils is underway. Together with AGERI and FAO, ICARDA is setting up workshops on the development and harmonization of biosafety regulations in WANA countries. The first workshop is planned for September 2000.

Technology for NARS partners

While the project on DNA Marker-Assisted Breeding and Genetic Engineering is currently one of the most advanced of the current Germany-funded projects with ICARDA, other biotechnology projects have expanded the pool of expertise in ICARDA's mandate region.

Use of DNA-Markers in Selection for Disease Resistance

Genes in Barley was a two-year project funded by the BMZ, and involving ICARDA and the Institut für Pflanzenbau und Pflanzenzüchtung, Technical University of Munich (Prof. Dr. G. Fischbeck, Dr. A. Jahoor). This special project allowed ICARDA to adopt molecular marker technology for gene mapping and marker-assisted selection in breeding programs. At the onset of the project, none of the marker technologies used for genetic mapping and genome analysis in cereals were established. The group of Prof. Dr. G. Fischbeck, University of Munich, Weihenstephan, was identified as a suitable partner because of its well-established expertise in genome analysis in barley.

The main objective of the project was to develop the DNA marker technology for mapping and tagging of host plant resistance genes in barley at ICARDA. NARS were not initially intended to be the

primary end-users of the mapping technology. However, the two markers identified for the two host plant resistance genes were products that could be used by NARS scientists for their own marker-assisted selection programs in barley.

Although only a few WANA laboratories, (AGERI in Egypt, INAT in Tunisia, IPA in Baghdad, Iraq, SPII in Karaj, Iran, KISR in Kuwait, and the Field Crop Research Institute in Ankara in Turkey), have the capacity to carry out gene mapping and gene tagging projects in barley, the application of tagged markers seems to be possible in a number of NARS. This is because of the much lower capital investment needed to apply a marker-assisted selection system. ICARDA's biotechnology program therefore developed a separate project on technology transfer to the region, **Development of Biotechnological Research in the Arab States**, which was funded by AFESD (Arab Fund for Economic and Social Development). This was possible thanks to the fruits of the initial investment from Germany.

ICARDA's early involvement with biotechnology has therefore had a number of successes. These include identifying the markers for powdery mildew (*Erysiphe graminis*) and *Rhynchosporium secalis* (or scald) in barley, *Fusarium* wilt and cold tolerance in lentil, and *Ascochyta* blight in chickpea. ICARDA has also been able to use the doubled haploid technique in developing wheat varieties with resistance to Hessian fly, a North African pest, and is currently looking for the relevant genetic markers.

Meeting the aims of the BMZ

The BMZ has a number of clearly-stated aims underlying the generous support it gives to specific projects in the developing world. Here are two examples of projects encapsulating these aims which dovetail precisely with those of ICARDA in alleviating poverty in the dry areas without creating further risk or damage to natural resources already under severe pressure.

Integrated Disease Management (IDM) in Cereal and Legume Based Cropping Systems of the West Asia and North Africa Region

The three-year project ran from January 1995 to December 1997 and involved extensive cooperation between ICARDA, NARS and German institutions. These were: University of Bonn, Institute of Plant Pathology; University of Giessen, Dept. of Plant Pathology; University of Munich, Department of Plant Breeding; Ministry of Agriculture, Syria; Ethiopian Agricultural Research Organization (EARO); Institut National de la Recherche Agronomique (INRA), Morocco.

Alternative packages for IDM for cereal and legume-based cropping systems were developed for three selected agroecological zones in WANA. These packages contained the following components: (1) Host resistance; (2) Crop rotation; (3) Agronomic practices; (4) Agrochemicals and biocides; (5) Disease-free seed.

Part of the research on host resistance was conducted with the assistance of a Post-doctoral Fellow from Germany, under the supervision of ICARDA scientists. Likewise, a Post-doctoral Fellow from the region, supported by ICARDA scientists, conducted the research on crop rotation and on agronomic practices. ICARDA conducted the research on agrochemicals and biocides and on seed health.

Different combinations of host resistance, agronomic practices, rotation sequences, agrochemicals and/or biocides were evaluated for their combined effects on disease incidence and severity in on-station trials.

Researcher-managed on-farm trials of the assembled IDM packages were conducted in three agro-ecological zones (high, moderate and low rainfall zones) in cooperation with NARS scientists in Syria, Morocco and Ethiopia. This included training for the NARS scientists and for National Professional Officers coordinating the national trials. Pilot recommendations were made on integrated disease management and the most appropriate IDM packages taken through to further testing in farmers' fields.

Resource Management for Sustainable Agricultural Production in West Asia and North Africa

This three-year project from 1994-1997 was funded through BMZ/GTZ at a cost of DM 1.6 million. It brought together NARS and Universities in WANA with the University of Karlsruhe, Dept. of Hydraulic Structures and Remote Sensing (Prof. Dieter Prinz; Dr Melfried Sties) and the Christian Albrecht University, Kiel, Dept. of Agricultural Economics (Dr Rolf Mueller).

Research addressed specific problems associated with water management in the dry areas. Work on water in general, and in this project in particular, have great impact, not only on water-related aspects of crop production in the dry areas but also on the performance of other factors such as germplasm, agronomic management and socio-economic factors. The results obtained through this project helped in enhancing water availability in the drier environments through improved water harvesting techniques, and in improving production and water use efficiency through supplemental irrigation in rainfed areas. The project responded not only to the needs of the NARS in WANA, but also to the concerns of the international community related to water resources management in this water-scarce region.

Technologies were produced to benefit the farmer while sustaining the resource base and the environment. Of these technologies, the simplest are those for farm level adoption, such as improved scheduling of supplemental irrigation for increased yields and water-use efficiency, but others are available for use by executing agencies for planning and implementing large scale development projects, such as the package developed using remote sensing and GIS for selecting the appropriate sites and methods for water harvesting. This package can be used by national programs to facilitate and efficiently plan and design water harvesting in the steppe of WANA. Other technologies ready for use in the development of target areas include the optimization package for supplemental irrigation, the guidelines for the construction of small water harvesting reservoirs, and the expert criteria for water harvesting methods.

Mutual benefits

The immediately-apparent results from these and the many other BMZ/GTZ-funded projects are the direct improvement of technologies, new crop varieties and techniques that can be passed on to resource-poor farmers through the NARS. There are many other benefits that are slower to mature but just as valuable in the battle to eradicate poverty and malnutrition.

Not only are junior scientists from the WANA region trained in cutting edge technology, the NARS and national research institutes gain from access to new methodologies. ICARDA runs a comprehensive series of in-house and in-country training courses to ensure that expertise is shared.

There is benefit too for the junior scientists in German universities and institutions who have the opportunity to work in the field with the foremost center carrying out agricultural science research in the dry areas. The knowledge and expertise they gain will stand them in good stead throughout their future careers, which will in many cases remain within the ambit of the dry areas.

A summary of ICARDA projects supported by Germany

BMZ/GTZ RESTRICTED PROJECT FUNDING

DNA Marker Assisted Breeding and Genetic Engineering of ICARDA Mandated Crops. Phase II.

Collaborating Institution(s): Agricultural Genetic Engineering Research Institute (AGERI), Egypt
Plant Molecular Biology, University of Frankfurt; Department of Molecular Genetics, University of Hannover.

Project Duration: January 1999 - February 2002

Budget: DM 1,900,000

QTL Analysis by Molecular Markers of Agronomically-Important Characters of Barley for Dryland Conditions

(Extension to Project *Use of DNA-Markers in Selection for Disease Resistance Genes in Barley*)

Collaborating Institution(s): Technische Universität München, Lehrstuhl für Pflanzenbau und Pflanzenzüchtung
Project Duration: June 1997 - May 1999
Budget: DM 950,000

Farmer Participation and Use of Local Knowledge in Breeding Barley for Specific Adaptation

Collaborating Institution(s): University of Hohenheim
Agricultural Research Center, SMAAR, Syria
Project Duration: January 1996 - December 1998
Budget: DM 986,827

DNA Marker Assisted Breeding and Genetic Engineering of ICARDA Mandated Crops

Collaborating Institution(s): Plant Molecular Biology Biocentre, University of Frankfurt.
Department of Molecular Genetics, University of Hannover.
Institut National Agronomique de Tunisie (INAT), Tunisia
Project Duration: January 1996 - December 1998
Budget: DM 1,900,000

Integrated Disease Management in Cereal and Legume Based Cropping Systems of the West Asia and North Africa Region

Collaborating Institution(s): Institut für Pflanzenkrankheiten, University of Bonn.
Department of Biotechnology and Plant Breeding; Institut für Phytomedizin, University of Hohenheim.
Department of Plant Breeding, University of Munich.
Crop Protection Division, Ministry of Agriculture, Syria;
Institute of Agricultural Research (IAR), Ethiopia.
Institut National de la Recherche Agronomique (INRA), Morocco.
Project Duration: January 1995 to December 1997. Extended to December 1998.
Budget: DM 1,635,645

Resource Management for Sustainable Agricultural Production in West Asia and North Africa

Collaborating institutions: National Agricultural Research Programs (NARS) and Universities of West Asia and North Africa.
University of Karlsruhe, Dept. of Hydraulic Structures and Remote Sensing
Dept. of Agricultural Economics, Christian Albrecht University, Kiel.
Project Duration: May 1994 - April 1997. Extended to December 31 1997.
Budget: DM 1,646,900

Use of DNA-Markers in Selection for Disease Resistance Genes in Barley

Collaborating Institution(s): Technical University, Munich
Project Duration: July 1993- June 1996; extended through May 1997
Budget: DM 767,155

Collaborative project between ICARDA and the University of Frankfurt on DNA Fingerprinting in chickpea

Collaborating Institution(s): Botanical Institute, University of Frankfurt
Project Duration: February 1992 - January 1995
Budget: DM 949,280

Characterization of the causal agent of an apparently new virus disease of faba bean, lentils

and chickpea in West Asia and North Africa

Collaborating Institution(s): Biologische Bundesanstalt für Land und Forstwirtschaft (BBA), Institute of Biochemistry and Plant Virology, Braunschweig
Project Duration: July 1992 - June 1995
Budget: DM 540,000

Land Use Management for Marginal Lands in the Barley/Livestock Zones of Jordan and Syria

Collaborating Institution(s): University of Hohenheim
Project Duration: October 1990 - September 1993
Budget: DM 384,500

Strengthening research on lentils, peas, chicklings and vetches at ICARDA to promote their productivity and yield stability in the West Asia and North Africa Region

Collaborating Institution(s): University of Bonn
Westfälische Wilhelms-University, Münster
Max Planck Institute for Biotechnology, Munich
Project Duration: 1990 - 1992
Budget: DM 2,784,000

The efficient use of cereal residues as a source of feed for small ruminants in West Asia and North Africa (WANA)

Collaborating Institution(s): University of Hohenheim
Project Duration: January 1990 - December 1992. Extended to December 1993
Budget: DM 2,616,000

Faba Beans and Lentil Improvement Program

Collaborating Institution(s): University of Hohenheim
University of Bonn
George-Augustus University of Goettingen
University of Tübingen
Project Duration: January 1986 - December 1988
Budget: DM 3,500,000 per year

Dry Peas Improvement Program

Collaborating Institution(s): University of Hohenheim
Justus-Liebig University of Giessen
Project Duration: January 1986 to December 1988
Budget: DM 500,000 per year

GTZ FUNDING (GTZ Technical Assistance)

Raising Efficiency and Efficacy of Seed Production and Marketing Systems in the WANA Region

Project Duration: 1999 - 2001
Budget: DM 350,000

Action Research for Sustainable Ground Water use in Syria

Collaborating Institution(s): Christian-Albrechts-University (CAU), Kiel. Department of Agricultural Economics.
Project Duration: 1999 - 2001.

Budget: DM 76,200

Workshop: Local Seed Supply Systems: Status, Constraints and Prospects

Project Duration: December 1996 - December 1997

Budget: DM 42,000-

Assessment of Research and Seed Production Needs in Dryland Agriculture in the West and Central Asian Republics (Workshop)

Project Duration: August 1995 - 31 January 1996

Budget: DM 154,000

Privatization of the Seed Industry in the WANA Region (Workshop)

Project Duration: August 1995 - 31 January 1996

Budget: DM 146,000

Development of National Seed Production Organizations in WANA

Project Duration: Phase I: July 1985 - June 1988

Phase II: January 1989 - December 1991

Phase III: January 1992 - December 1994

Extension: December 31, 1997

Budget: Phase I: DM 553,380

Phase II: DM 830,000

Phase III: DM 1,080,000

Biology and Control of Orobanche in Legume Crops

Collaborating Institution(s): Institute of Plant Production in the Tropics and Subtropics,
University of Hohenheim
University of Tubingen
University of Bonn

Project Duration: 1985 - 1992

Budget: Salary and employment costs of full-time German researchers
(1985-1995)

Other Collaboration with Germany

Germany's support for ICARDA's work is not confined solely to such special projects; Germany has also made core contribution to ICARDA's core budget. Lately, it has shown particular interest in the work in those Central Asia and Caucasus countries that were formerly part of the Soviet Union.

ICARDA's major involvement with the NARS of Central Asia began in 1995 when the Center took the initiative in organizing a workshop to identify the agricultural research and seed production needs of Central Asia and the Caucasus. The meeting, partially supported by the BMZ and GTZ of Germany, was held in Tashkent in

collaboration with the Uzbekistan Academy of Agricultural Sciences. CIMMYT, IPGRI and ISNAR also took part.

Early achievements in the region by ICARDA included technical assistance for seed production in CAC, provided through consultancies for GTZ in Tajikistan, the World Bank Agricultural Support Services project in the Kyrgyz Republic, and a seed sector study in Kazakhstan.

The GTZ has a long involvement in seed production improvement and the economics of seed delivery in WANA in a partnership with ICARDA that continues to the present time through ongoing projects and support for training initiatives. Indeed, the GTZ was responsible, with the Netherlands, for setting up and sharing the costs of building the Seed Production Unit at ICARDA in 1985. This support continued for 10 years through the Unit's establishment and development phases into a maturity where the Unit now has a vital role not only in assuring the quality of seed shared with ICARDA's NARS partners but in providing a highly effective production unit for training technicians from throughout WANA.

ICARDA's Current German Partners in Collaboration in Advanced Research

BBA (Institute for Biochemistry and Plant Virology), Braunschweig, Germany

- Control of Faba Bean Necrotic Yellow Virus

University of Bonn

- QTL analysis in barley
- Ecology and biology of cereal cyst nematodes.

University of Frankfurt am Main

- Development and use of DNA molecular markers for indirect selection in chickpea.
- Characterization of *Ascochyta rabiei* and mapping of geographical distribution in WANA.

Giessen University

- Sustainable management of a Mediterranean-type agroecosystem: Results from crop simulation studies.

University of Göttingen

- Development of wheat germplasm with multiple disease resistance.
- Use of chemical stimulants to improve drought tolerance in lentil.

University of Hannover

- Development of transformation protocols for chickpea and lentil

University of Hohenheim

- Barley market studies and economic assessment of grain and straw quality and morphological traits.
- Straw quality: breeding and evaluation methods (near infrared reflectance and histochemistry).
- Simulation studies on the sustainability of Mediterranean cropping systems.
- Effect of heterozygosity and heterogeneity on yield stability of barley.
- Stability of crop/range/livestock systems in the Al Bab area in northern Syria.
- Socioeconomics in Bedouin farming systems in the marginal areas of northern Syria.
- Physiological factors as determinants of yield in durum wheat.
- Effect of legume crop residues on productivity of wheat.

University of Karlsruhe

- Use of remote sensing and GIS for identification of water harvesting sites.

University of Kiel

- Assessment of information needs for development of water management models.
- Institutions of supplemental irrigation

Max Planck Institute for Biochemistry, Munich

- Resistance mechanisms in chickpea to leafminer.

Technical University, Munich

- Use of DNA markers in selection for disease resistance genes in barley

Weinsteophans Institute, Munich

- Molecular markers for QTLs

German Nationals: Past and Present Members of ICARDA Staff

As indicated earlier, the German association with ICARDA has been long and fruitful, stemming from the very inception of the Center. The first Director of Research of the Center was Prof. Dr Heinrich Weltzien, who returned to the University of Bonn in 1981. One of the longest-serving international members of the ICARDA staff also hails from Germany, Farm Manager Dr Juergen Diekmann, who joined ICARDA in 1981 at its Tel Hadya headquarters in Syria.

In 2000 there are nine German nationals, including Dr Diekmann, serving with ICARDA. With the Germplasm Program are Dr Michael Baum (Senior Biotechnologist), Dr Miloudi Nachit (Durum Wheat Breeder seconded from CIMMYT, Mexico), and Dr Bruno Schill (Post-doctorate Fellow). In the Natural Resources Management Program, there are Dr Wolfgang Goebel (Agroclimatologist), Dr Andrea Pape (Visiting Research Fellow), Mrs Monika Zaklouta (Research Associate), and Dr Michael Zöbis (Soil Conservation/Land Management Specialist). Dr Heinz Peter Wolff is a Visiting Scientist/Natural Resource Management Economist with the ICARDA's Nile Valley and Red Sea Regional Program based in Cairo.

A further 11 Germans have worked for ICARDA in the past. These are Drs Marlene Diekmann (Visiting Scientist-Pathology);

Horst P.K. Gaul (Forage and Pasture Consultant); S. Gerlach (Entomologist); Karl-Heinz Linke (Post-doctoral Fellow-Orobanche); M. Mayer (Post-doctoral fellow/Barley Breeder); J. Saurborne (Post-doctoral Fellow-Orobanche); Franz Weigand (Biotechnologist); Mr P. Eichhorn (Machinery Supervisor); G. Ekkhard (Associate Expert); Ulrich Maerz (Visiting Scientist) and Mr D. Multz (Agricultural Scientist).

Member of the External Review Panel

Mr Dieter Brauer, Editor, Development and Cooperation (D+C), published by Deutsche Stiftung für international Entwicklung (DSE), was a member of the external review panel for ICARDA's Information and Computer Services Unit in 1998.

Germany's support for graduate studies

A number of German students, as well as those from other countries, working for their Masters and Doctoral degrees have benefitted from support from Germany. These students conduct a part of their work at a University in Germany, and a part at ICARDA, and have co-supervisors from Germany and ICARDA. This innovative model of capacity building, which Germany and ICARDA have implemented as partners, enables the graduate students to have access to international expertise and facilities, and provides them opportunities to make new contacts. Interaction at the international level adds to their personality development in the course of their work. The table on the following pages provides a list of students who have benefitted from this joint program, as well as the names of the Universities and scientists who have participated/are still participating in this important collaborative effort.

Germany and other Students, registered in German Universities, who did their research at ICARDA under joint supervision of Professors in Germany and Scientists at ICARDA.

Student	Degree & Duration	University & Professor	Thesis Title
German Nationals			
1. Hans Jürgen Kaack	PhD 1981-1983 *	Rheinische-Friedrich-Wilhelms Uni./Bonn Prof. Dr. Heinrich Weltzien	Investigations of epidemiology and control of <i>Ascochyta rabiei</i> (Pass.) Lab., the causal agent of ascochyta blight on chickpea
2. Christian Jung	MSc 1984 *	Georg-August-Untiv. Göttingen Prof. Dr. H.C. G. R`bbelan	Eigenleistung und Interaktionen von Weizen-und Roggen-Genomen in Triticale
3. Bernd Augustin	PhD 1985 *	Rheinische-Friedrich-Wilhelms-Untiv./Bonn Dr. R. Sikora	Biology, distribution and control of the stem nematode <i>Ditylenchus dipsaci</i> (Kuhn), on <i>Vicia faba</i> L. in Syria and other countries of the Near East and North Africa
4. Ms Elke Steinmann-Oelck	PhD 1982-1985 *	Rheinische-Friedrich-Wilhelms-Untiv./Bonn Prof. Dr. Heinrich Weltzien Dr. F. Klingauf	Biology and distribution of insect pests of faba bean <i>Vicia faba</i> L. in Syria, and investigations on resistance of different <i>Vicia faba</i> lines to black aphids, particular <i>Aphis fabae</i> Scop.
5. Edwin Weber	MSc 1985-1986 *	Hohenheim Prof. Dr. H. Marschner	Effect of Va-Mycorrhiza and phosphate fertilization on growth and yield of chickpea (<i>Cicer arietinum</i> L.)
6. Franz Weigand	PhD 1986 *	Rheinische-Friedrich-Wilhelms-Untiv./Bonn, Prof. Dr. H.C. Weltzien	Importance of the phytoalexins medicarpin and maachian as components of a resistance mechanism against <i>Ascochyta rabiei</i> in different lines of chickpea
7. Ms Eva Weltzien	PhD 1981-1986 *	Technische Uni. München Prof. Dr. G. Fischbeck	Adaptability of Near East barley landraces to marginal growth condition
8. Andreas Mayer	MSc 1986-1987 *	Hohenheim Uni. Dr. J. Sauterborn	Herbicides for the control of <i>Orobancha crenata</i> (Forsk) on faba bean and lentil

9. Stephan Mahner	PhD 1985-1987 *	Bonn Prof. Dr. H.C. Weltzien	Yield decline in continuous cereal cropping
10. Ulrich Maetz	PhD 1986-1990 *	Hohenheim Uni. Prof. Dr. W. Doppler	Farm classification and impact analysis of farming systems in northern Syria
11. Jurgen Michael Sting	MSc 1987 *	Hohenheim Uni. Prof. Dr. W. Doppler	The economy of the integration of livestock and trees in a dry area of Syria
12. Petra Engelhard	MSc 1988 *	Justus-Liebig-Uni Giessen Prof. Dr. J. Al Kamper	Development and control of <i>Orobancha crenata</i> on peas (<i>Pisum sativum</i>) in Syria
13. Theodor Friedrich	PhD 1988 *	Georg-August-Uni Goettingen Prof. Dr. J. Al Kamper	Investigations of lentil harvest mechanization using the pulling principle in comparison with other lentil harvest methods in Syria
14. Stefan Kachelriess	MSc 1988 *	Justus-Liebig-Uni Giessen Dr. J. Sahlberbon	<i>Orobancha</i> on <i>Vicia faba</i> and preferred methods for its control
15. Gerold Eduard Wyrwal	MSc 1988 *	Hohenheim Prof. Dr. W. Kock	Studies of the population of seeds of <i>Orobancha</i> spp. in naturally infested areas and its interaction with crop plants
16. Norbert Billenkamp	MSc 1988 *	Hohenheim Prof. Dr. P. Rueckenbauer	Untersuchungen zur photoperiodischen Reaktion von Durumweizen
17. Ms Annette Rink	MSc 1988-1989 *	Justus-Liebig Giessen Prof. Dr. J. Steinbach	The Awassi sheep: productivity, parasitic infection and phenotype
18. Ms Christiane Scheibel	MSc 1989 *	Hohenheim Dr. J. Sauerborn	Study on the effect of fungal pathogens on <i>Orobancha</i>
19. Ms Doris Vetterlein	MSc 1989 *	Hohenheim Prof. Dr. Marschner	Effect of vesicular-arbuscular mycorrhiza on the growth and drought tolerance of chickpea (<i>Cicer arietinum</i> L.)
20. Martin Engelhard	PhD 1990*	Justus-Liebig Giessen Prof. Dr. J. Alk@ mper	Investigations on the improvement of dry pea cultivation in a semi-arid location in Syria
21. Markus Knapp	MSc 1990 *	Hohenheim Dr. J. Sauerborn	Studies on transpiration of <i>Orobancha crenata</i> Forsk., and on the effect of parasitism on transpiration and photosynthesis of various host plants
22. Stefan Schlingloff	PhD 1986-1991 *	Justus-Liebig Giessen Prof. Dr. J. Alk@ mper	The effect of weed control on yield and water use of dry peas in the semi-arid rain-fed agriculture in Syria
23. Michael Mayor	PhD 1989-1992 *	Hohenheim Prof. Dr. H.H. Geiger	Breeding experiments with doubled haploid lines and F ₂ -bulks towards the improvement of barley in the dry areas of north Syria
24. Edwin Weber	PhD 1987-1992 *	Hohenheim Prof. Dr. J. Marschner	Role of vesicular-arbuscular mycorrhizae in the mineral nutrition of chickpea (<i>Cicer arietinum</i> L.) grown in northern Syria
25. Ms Sabine Mueller	MSc 1987-1988 *	Hohenheim Prof. Dr. Gall	The regeneration of medic pastures in a ley farming system and their value for sheep production in northern Syria
26. Thomas Bambach	PhD 1986-1988*	Hohenheim Prof. Dr. P. Rueckenbauer	Genetics of phosphate uptake in chickpea
27. Ms Sabine Pabst	MSc 1988-1990 *	Hohenheim Prof. Dr. Christian Gall	Weed control by grazing small ruminants with particular emphasis on goat grassing
28. Ms Christa Probst	MSc 1988-1990 *	Hohenheim Prof. Dr. P. Rueckenbauer	Studies on yield stability of barley varieties in Syria mixtures of barley
29. Ms Christine Vorlander	MSc 1988-1989 *	Giessen Prof. Dr. Alk@ mper	Soil solanization for <i>Orobancha</i> control

50. Ms Carina Moller	MSc 1997 *	Justus-Liebig-Uni Giessen	Untersuchung der Gluteninvariation in einer Durumweizensammlung (<i>Triticum turgidum</i> L. ssp. <i>durum</i> (Desf.))
51. Ms Carina Moller	PhD 1998-2000	Giessen Prof. Dr. Joachim Sauerborn	Sustainable management of a Mediterranean type Agro-ecosystem
52. Ms Claudia Kaestner	MSc 1998-	Hannover Prof. Dr. E. Hacker	Survey and evaluation of soil erodibilities in the Khanasser Valley, Northern Syria
* Thesis completed			
Students from Other Nations			
53. Ahmed Mosaddeg Manschadi	PhD 1992-1996 *	Hohenheim Prof. Dr. J. Sauerborn	Modeling seed yield loss in <i>Vicia faba</i> L. caused by <i>Orobancha crenata</i> Forsk. considering the influence of soil moisture and temperature
54. Ms Thami Alami Imane	PhD 1990-1991	Giessen	Selection of <i>Rhizobium meliloti</i> from acid soil in Morocco
55. Salah Abdelgadir Abdelmajid	PhD 1987-1992 *	Hohenheim Prof. Dr. W. Doppler	The economic impact of faba bean introduction in smallholdings: A case study of the Gezira Scheme, Sudan
56. Ms Ghufraan Abdu Kattach	PhD 1991-1995 *	Giessen Prof. Dr. J. Steinbach	Phenological and physiological characterization of native legumes in the Syrian steppe
57. Peter Stefany	PhD 1988-1992 *	Hohenheim Prof. Dr. P. Ruckebauer	Daylength and temperature response in durum wheat

* Thesis completed

ACRONYMS

ARO	Advanced Research Organization
BMZ	Federal Ministry for Economic Cooperation and Development
CGIAR	Consultative Group on International Agricultural Research
BEAF	Beratungsgruppe für Entwicklungsorientierte Agrarforschung
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
FAO	Food and Agriculture Organization of the United Nations
GL-CRSP	Global Livestock Collaborative Research Support Program
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
ICARDA	International Center for Agricultural Research in the Dry Areas
INRA	Institut National de la Recherche Agronomique (Morocco)
NARS	National Agricultural Research System
USDA/ARS	US Department of Agriculture/Agricultural Research Services
WANA	West Asia and North Africa

