ICARDA 25
A Promise of Hope

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Mohamed A. Nour

International Center for Agricultural Research in the Dry Areas

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About the author

Born in 1925 in Sudan, Dr Mohamed A. Nour has devoted his entire life to agricultural research and development. A former Minister of Agriculture in Sudan (1969-70), he has held diverse positions of responsibility in teaching and research at national, regional and international levels. During his association with the Faculty of Agriculture, University of Khartoum (1951-69), he served as Professor and Dean for 13 years. He was FAO Regional Director for the Near East and North Africa, 1970-1978; Deputy Director General of ICARDA, 1978-80; Director General of ICARDA, 1981-87; UN Assistant Secretary (Director, UNDP Regional Bureau for Arab States and Europe, based in New York), 1987-91; and Executive Director, Centre for Environment and Development: Arab States and Europe (CEDARE), 1992-94. He is the winner of the Republican Medal (First Order), Egypt, 1978; the Neilen Medal (First Order), Sudan, 1980; and the Arz Medal (Commodore), Lebanon, 1990. Dr Nour is married and has four children. He currently lives in Cairo.

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ICARDA

International Center for Agricultural Research in the Dry Areas
P.O. Box 5466, Aleppo, Syria
Tel.: (+963) (21) 2213433, 2225112, 2225012
Fax: (+963) (21) 2213490, 2225105, 2219380
E-mail: ICARDA@cgiar.org
Website: http://www.icarda.cgiar.org

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Foreword

The year 2002 is an important milestone in ICARDA's life as it marks the Center's 25th anniversary. It is a time for reflecting on the past—and looking to the future.

If one were to identify the most significant achievement of ICARDA over the past 25 years, it is the close partnerships forged with national programs worldwide, particularly in the Central and West Asia and North Africa (CWANA) region, for which the Center has been commended by its peers. With feedback from its partners, ICARDA's research program has continued to evolve to address the key problems of increasing agricultural productivity, sustainable management of natural resources, alleviating poverty and developing human resources.

Of the progress made through these partnerships, three major achievements deserve mention here. First, by 2002, over 628 varieties of ICARDA-mandated cereal, legume, and pasture and forage crops had been released by our national partners for their farmers in Asia, Africa, Latin America, and several industrialized countries. The new, high-yielding varieties possess resistance to diseases and pests, and tolerance to environmental stresses—drought, heat and cold. With policy and extension services support from national governments, combined with improved, environmentally-friendly production practices, these varieties have helped change the face of agriculture in several countries.

Second, to support crop-improvement research, ICARDA has built a strong, modern gene bank—the largest in the southern Mediterranean region, holding about 127,000 accessions of its mandate crops and their wild relatives. This has been made possible through collection missions conducted jointly with national program partners and through donations received from other gene banks. A database on the evaluation and characterization of most of the accessions in the gene bank has also been developed. Researchers extensively use the material from ICARDA's gene bank worldwide.

Third, by the end of 2001, ICARDA had trained over 11,000 persons from 92 countries, and supported the research of over 450 students for MSc and PhD degrees. The impact of this achievement is seen in the establishment of strong research programs in many countries where they did not exist before, and in

the maturity of several national programs, which now work as ICARDA's equal partners. Several ICARDA-trained scientists now hold positions of responsibility in their countries or in regional and international programs. ICARDA has thus succeeded in generating the necessary momentum—and setting the direction in the global context—for agricultural research in the dry areas and in developing the expertise to conduct that research.

The Center continues to expand and strengthen its collaboration with national programs. A major breakthrough recently was forging partnerships with the Republics of Central Asia and the Caucasus. In September 1997, the first Regional Coordination Meeting for Central Asia took place at ICARDA headquarters. Twenty-four senior research scientists and research administrators from the newly independent republics participated in the meeting. Subsequently, nine CGIAR centers formed a Consortium on Central Asia, with ICARDA as the focal point. The latest breakthrough was the initiative taken by the Center in 2002 to form the "Future Harvest Consortium to Rebuild Agriculture in Afghanistan."

Building on its achievements and experience, and in consultation with its partners, ICARDA develops its three-year Medium-Term Plans. ICARDA's research seeks to integrate gene management with natural resource management to develop crop varieties and technologies that can withstand the harsh and often variable climate of the dry areas. Both conventional and new tools of science are used. Priorities include soil, water and biodiversity. Soil is at risk from wind and water erosion, nutrient depletion and salinity from unsuitable irrigation. The world's dry areas face worsening water poverty. So research on water conservation and on-farm water management is receiving greater attention. Plant genetic resources are needed to find sources of drought and heat tolerance and resistance to pests and diseases, under a changing climate. Farmer participatory plant breeding, introduced by ICARDA in its research program, is helping to find appropriate solutions to specific problems and to ensure their application in farmers' fields.

The per-capita Gross Domestic Product of over 700 million people in the dry areas is less than US$ 2 per day. Poverty in these areas can mean a progressive neglect of, and damage to, natural resources. The knowledge generated from agricultural research can help to break the complex cycle of poverty and loss

of natural resources. Advanced tools of science such as genetic engineering, geographic information systems, remote sensing, information technology and computer expert systems are helping to achieve sustainable techniques for sustainable water conservation and increased water-use efficiency, increases in production, and generating increased income. Through a participatory approach, agriculture can integrate the poor into the research process, better use their productive capacity, and generate a sense of stewardship of natural resources.

Dr Mohamed A. Nour, who was Director General of the Center from 1981 to 1987, generously agreed to give his time to write this volume. With his intimate knowledge of ICARDA's birth and development, his continued interest in the progress of the Center, and his unique style of writing, he has, in this volume, meticulously summarized the experiences and achievements of the Center in the last 25 years. This was truly a challenging task that Dr Nour ventured to undertake, but ICARDA management is aware that the narration of the history of an organization is seldom received with full satisfaction by all those who contributed to its development, as it may miss to capture certain events that some may consider important.

The achievements so succinctly presented in this volume have been possible because of the dedicated efforts of ICARDA's staff representing more than 40 different nationalities, ably guided by the Centre's Directors General—Drs. Harry S. Darling (1977-81), Mohamed A. Nour (1981-87), and Nasrat Fadda (1988-95)—and Board of Trustees chaired by Drs. Taher Obaid (1978-80), Andreas Papasolomontos (1980-85), Ekkehard Clemens (1985-86), Jose I. Cubero (1986-89), Enrico Porceddu (1989-94), Alfred Bronnimann (1994-99) and Robert Havener (1999-).

There could be no better occasion to release this volume than ICARDA's 25th anniversary. We hope all those interested in global agricultural research and development will find this volume of interest.

Prof. Dr Adel El-Beltagy
Director General
ICARDA

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Preface

Early in 2001, Prof. Dr Adel El-Beltagy, the Director General of ICARDA, was deeply immersed in his business, when a fleeting impulse prompted him to propose celebrating ICARDA's 25th anniversary. The Board of Trustees of the Centre endorsed his idea. Together with his staff, the thought unfolded steadily into a magnificent reality.

Another brainwave of his at that time was to underpin this landmark by placing on record, through a fairly comprehensive document, the history as well as the envisaged future of ICARDA.

In spelling out his thoughts on this issue, he stressed that the checks and bounds for a document of this nature, to be satisfactorily convincing, should be three. First, it must parade the historical facts succinctly and accurately. In so doing, the document must endeavour to become–upon publication–a reliable source of reference. Accordingly, it should stand the test of time as a dynamic fountain of knowledge. Second, it should offer a convincing rationale that by the establishment of ICARDA, not only is the generous financial support it has received, and continues to receive from donors, well justified, but that its cumulative output has significantly enriched science relevant to its mission through unique models of partnership with national agricultural research systems (NARS). Third, and most importantly, that when we objectively extrapolate through a forward look, we discern the healthy growth of a service-oriented institution through its overall output steadfastly based on the dynamic flow of information from the national programmes on the one hand, and from Centres of Excellence in science and technology on the other. More succinctly, this document should thus elucidate that all the financial and human input that has gone into the creation and growth of ICARDA has contributed to improving the welfare of the poor farmers in the dry areas and sustaining the health of our planet. Foremost in mind on this score, he stressed two parameters. One was ICARDA's performance, which convinced donors to continue to support the Centre financially. The other was the evidence that the national programmes in

the region as well as globally, have interfaced comfortably with ICARDA, and energetically and positively contributed to the advancing trends of science adopted by the Centre as time unfolded.

In his quest for the implementation of this idea, the Director General approached several persons. As the idea developed into a process, and as the process produced the first drafts of the chapters, several colleagues associated with ICARDA contributed to enrich those drafts. Owen Brough compiled his memoirs that helped significantly in writing "An Historical Note" section in Chapter 2. Mohan Saxena developed the first draft of Chapter 4 on research. Mahmoud Solh assisted by Hala Hafez refined the draft of Chapter 7 on international cooperation. Dyno Keatinge sent in his own story on highland research initiated under his leadership at Quetta, Balochistan. Edward Sayegh greatly assisted in what constitutes the backbone of Chapter 8 on finance, later supplemented by a significant input from Suresh Sitaraman. Samir El-Sebae Ahmed and Habib Ibrahim wrote the first drafts on human resource development; Jurgen Diekmann on the Tel Hadya farm; Khaled Makkouk on virology; Khaled Bizri and Zaid Abdul Hadi on the computer services; and Surendra Varma on communication and information. Faik Bahhady wrote on the acquisition of Tel Hadya farm donated to ICARDA by the Government of Syria, and Houda Nourallah on the reaction of farmers at the time of land expropriation and the aftermath. Afaf Rashed compiled some basic data. Joseph Hulse gave us a brief but rich contribution on the role of IDRC in the first phases of ICARDA. A wealth of information and material was gathered through the courteous help of the CGIAR Secretariat in Washington D.C., and from the archives and references available at the Ford Foundation in New York. Willie Erskine and his wife Mira critically reviewed the entire text.

Two distinguished persons gave generously of their time on most of the draft chapters as the work proceeded: Andreas Papasolomontos, former Minister of Agriculture of Cyprus, and second Chairman of the ICARDA Board; and Robert Havener of the USA (now ICARDA Board Chairman), whose vanguard contributions in the creation of ICARDA and its development permeate the pages of this book.

The bulk of this document was produced at the NVRP/ICARDA Cairo Office. We obtained, throughout, willing and free support from that office, then under the leadership of Mahmoud Solh, and with support from Nagwa Lotfi. Finally were the overall editing and finishing touches that led to the printing phase. This arduous-cum-delicate task was ably undertaken by Surendra Varma, head of communication and information services and his team at ICARDA. Abdul Rahman Hawa developed the cover design, Wafa Meskine typeset the manuscript and Joyce Bendki proofread the draft document.

This book, however, would not have been balanced without the generous comments and ideas given by the NARS through discussions, interviews, draft texts, conferences, workshops, and seminars ever since ICARDA was established. This stems from the dictum that the growing relevance of ICARDA's science is a direct reflection of its dynamic interfacing with the NARS. To mention all the names would constitute a vast—though rich—list beyond the scope of the space available.

Some of those who contributed (in numerous ways) have sadly passed away: Taher Obaid of Saudi Arabia, first Chairman of the Board of Trustees; Ali Abdel Aziz of ARC, Egypt; Harry S. Darling, first Director General of ICARDA; Ibrahim Shihata of the World Bank; Omond Solandt of Canada, and Ahmed Kamel and Ali Abed El-Ali both former ICARDA staff members. Many have left their posts to higher positions or have since retired. Suffice to state, therefore, that ICARDA Board of Trustees Chairmen and members, its directorate and staff, past and present, are deeply grateful to all those named and unnamed personalities and institutions for their valued contributions.

Last, and certainly not least, ***"ICARDA 25: A Promise of Hope"*** retrospectively on the one hand, and on future vision and horizons on the other, would not have been the solid reality we see today had it not been for the foresight of the late President Hafez Al-Assad in donating Tel Hadya land which tipped the balance to Syria, hosting the Principal Station. On the footsteps of his father, President Bashar Al-Assad, a strong protagonist of the role of science and technology in development, recently signed an Act to have Syria join the CGIAR as a donor of $500,000 annually.

Finally this Centre would not have been the reality it now represents had it not been for the donors (Appendix 7) who share the mission of ICARDA, and who have generously and continuously supported the Centre throughout the past 25 years to the magnitude of over US$ 450 million.

In conclusion, whilst the rich sources from which I have liberally drawn to compose this book are deeply, if generically, acknowledged, the responsibility for errors of omission or otherwise are entirely mine.

Mohamed A. Nour
April 2002

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1

The Best Show in Town: The CGIAR

What's in a Name?

The Ambassador to Lebanon was puzzled. It was 1978 and he had just been introduced to a member of the CGIAR.

"Is the CGIAR a private company?" he asked.
"No," came the answer.
"Since it deals with agriculture it must be part of FAO."
" Not really," was the reply.
"Is it then part of the UN or affiliated to it?"
"No," again the answer came.
"Is it part of a bilateral aid programme, such as USAID, SIDA, IDRC, or is it part of a multilateral cooperative project?"
"Well, not exactly, although several bilateral and multilateral bodies contribute to its funding," answered the member.
"So then, surely, it is a non-governmental organisation," concluded the Ambassador.
But the member of the CGIAR had another baffling answer: "Yes and no: it functions as if it were a NGO, but in fact it is largely controlled by governments."
The Ambassador threw his hands into the air and exclaimed: "Then I give up; you exhaust my knowledge on international modalities of cooperation."

By the end of his encounter the Ambassador was better enlightened but not fully comfortable with the chemistry of what was then a mere toddler in the already mature world of international development cooperation.

The man who coined the delightfully impossible name — Consultative Group on International Agricultural Research (CGIAR) — and managed to convince all the stakeholders to accept this nomenclature was a wizard: "worthy of highest praise," as Webster's Dictionary defines the word. That person was Robert S. McNamara, the then President of the World Bank. How that came to be and, later, how the CGIAR was created constitutes a rich part of this important story.

From the moment it was born (and to this day), the CGIAR had no legal status; it continues to be nebulously advisory. Nor do the largest key donors have any form of weighted vote. Rather, the CGIAR meetings move by consensus, never by ballot. In fact, all decisions in the CGIAR (its General Assembly, as it were) are reached by consensus following a process of consultations. To the layperson, however, the first impression might be that the CGIAR is most likely a private enterprise offering advice to others for a fee, and may even implement research projects on their behalf, as do all consultancies. This impression is, of course, way off the mark.

In the Words of a CGIAR Chairman

There can be no better description than that given by Dr Ismail Serageldin, then Vice President of the World Bank and Chairman of the CGIAR, when he attended the 20th anniversary celebrations of ICARDA on June 2, 1997. In a keynote address, he spoke on the evolution, mission and impact of the CGIAR, and on ICARDA. Here are some key excerpts from his address:

"When I became Chairman of the CGIAR in 1994, the biggest discovery was that it doesn't exist. There are no statutes, no by-laws, no formal rules and yet it functions. It has been written about in journals of public administration as a remarkable success, just like the bumble bee which technically should not be able to fly, but

as we all know, flies very well. So the CGIAR, despite not having any clear lines of authority, mandates, terms of reference, etc. functions very well indeed. So well that it is a model that is being emulated in many other parts and sectors, such as health, which are trying to capture that success. The core of this whole system is the 16 centres spread all over the world."

He concluded his statement with: *"The CGIAR has four great strengths: it is non-political; it is dedicated to excellence; it has a focused agenda; and it has a long-term commitment."*

Despite this lack of defined rules and regulations, it has worked so well in promoting agricultural research—and resulting in tangible impact—that it has served as a model for collaboration and partnership in other sectors. Although research by the 16 centres within the CGIAR represents only 3-4% of the total agricultural research in the developing world, its collaborative approach and its excéllence—more than half of the world food prizes have gone to CGIAR scientists—has had an enormous impact on agriculture and food production worldwide.

The Genesis

Since its inception, the CGIAR has grown rapidly in the world of international scientific agriculture and presents a high-profile image of exemplary research institutions in the service of developing countries. Dr Lowell Hardin, a prominent participant in one of the CGIAR meetings in Washington D.C. in the early 1980s, said that in comparison with other international endeavours "the CGIAR is the best show in town!" We naturally concurred then; we concur now. To see why that was—and still is valid—so, we must search first for the roots.

For a more detailed source, we cannot do better than refer our readers to the excellent book *Partners Against Hunger* by Warren Baum, published in 1986 for the CGIAR by the World Bank in Washington D.C. The author was Vice President of the World Bank, and from 1974 to 1983, he became the second Chairman of the CGIAR. Such has been

the accepted custom, that the chair traditionally be vested in the World Bank, a gigantic institution with a chemistry predominantly based in hard-nosed banking. Warren Baum was a fierce believer in, and a staunch protagonist of the CGIAR mission, both inside the Bank and well beyond its domain. He steered the CGIAR with visionary enthusiasm. When his term as Chairman ended, he soon published his definitive tome from which, among other CGIAR archives and sources, this chapter draws liberally.

The term Consultative Group, and sometimes the Consortium, is common World Bank generic terminology for targetted meetings called by the Bank. These are normally designed to serve an interested group of financing countries discussing the debt stress of a specific developing country, or groups of countries, under similar stress. The aim of these discussions is to circumvent such difficulties, through banking or other mechanisms such as debt rescheduling, structural adjustment, and so on.

Applied to the CGIAR, the term is still fitting in that this is a group of interested organisations and countries (donors) coming together on a consultative basis to tackle a set of specific financial issues. However, the CGIAR was not created to consider debt or financial issues. It was created for solving difficulties of an agricultural nature through science and research, and through human resource development. Each donor member pledges monies on a purely voluntary basis to support part or all the activities undertaken by institutions which came to be known as the International Agricultural Research Centres (IARCs). All of these exist under the financial and supervisory umbrella of the CGIAR, and are also an integral part of it.

An historic meeting, which came to be known as the First Bellagio Conference, was held at the Rockefeller Foundation Centre at Bellagio in northern Italy (April 23–25, 1969). It was called by Mr Addeke Boerma, then Director General of the Food and Agriculture Organisation of the United Nations (FAO). Senior representatives from almost all key donor agencies interested in the agricultural problems of the developing world took part. Among those represented were the

United Nations Development Programme (UNDP), the World Bank, Rockefeller and Ford Foundations, France, USA, Sweden, Canada, Japan, UK, the Development Assistance Committee of the Organisation for Economic Cooperation and Development (OECD), the Economic Commission for Africa (ECA), the Asian Development Bank (ADB), the Inter-American Development Bank (IADB), the European Development Fund (EDF), FAO and others (Appendix 1).

On the agenda for the meeting was a wide range of topics related to those limiting factors constraining agricultural development in the Third World, but particularly focussed on agricultural research needs, especially those for basic food crops, with the objective of augmenting productivity and alleviating hunger.

Prior to 1969, the Rockefeller and Ford Foundations had already jointly created the first four International Centres. In chronological order they were: International Rice Research Institute (IRRI) in 1960; Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT) in 1966; International Institute of Tropical Agriculture (IITA) in 1967; and Centro Internacional de Agricultura Tropical (CIAT) in 1967. The Rockefeller Foundation, followed by its Ford foundation counterpart, had pioneered the definitive models for IARC institutions. From a different standpoint, FAO was not just alive to the vital need to increase food production through research. It had already made inroads in several countries and regions through many individual projects in support of field experiments and training. These covered such fields as testing new high-yielding grain varieties, especially during the mid-1960s, following the Green Revolution in the Indian sub-continent.

The World Bank was represented at the First Bellagio Conference by the then President Robert S. McNamara. He proposed setting up a new Consultative Group or Consortium for fund-raising to launch a new initiative in support of international agricultural research. The idea attracted enthusiastic support from John Hannah, then Administrator of the United States Agency for International

Development (USAID), who indicated that the US Government would consider providing 25 percent of whatever amount could be raised. The fresh initiative and the new modality to fund application of this idea were beginning—even at this early stage—to come forcefully together. In subsequent rounds of Bellagio II, Bellagio III and in other places, the term Consultative Group on International Agricultural Research was adopted.

The First Bellagio Conference was attended by an illustrious group (see Appendix 1) of eminent men (sadly, no women) whose vision and steadfastness weathered the test of time, forming the firm foundation upon which the CGIAR grew. They set their sights on high horizons; their aspirations were realistic, realisable and timely; and thus they set in motion a human endeavour that became "the best show in town" for tackling the vital issue of agricultural research aimed at augmenting and improving basic food production.

Growth and Development

Bellagio I was rapidly succeeded by Bellagio II, a meeting of technical personnel (February 1970); by Bellagio III, for heads of multilateral and bilateral organisations (April 1970) and finally by Bellagio IV (December 1970). By then, the cast was firmly set. This expanding group of bilateral and multilateral agencies and foundations agreed on the form and functions of the CGIAR, on budgets needed for the four pre-existing centres and for one or two new centres in the pipeline, on the modality of operations of the centres, on the creation of a Technical Advisory Committee (TAC) to guide the CGIAR, and on a host of other scientific, technical and logistical issues that required tackling, including the creation of a secretariat at the Bank's premises. Within the CGIAR, three key international bodies agreed formally to take the lead: FAO, UNDP and the World Bank which became known generically as *Principal Sponsors or Co-founders*. It was further agreed that the World Bank would provide the Chairperson of the Group. The post went first to Richard H. Demuth (1971–74).

In January 1971, the Consultative Group comprised FAO, UNDP, the World Bank, the USA, the United Kingdom and three Foundations (Rockefeller, Ford and Kellogg). They were soon joined by Canada and the Netherlands. By May 1971, barely four months later, 17 countries and funding institutions declared formal commitment to the CGIAR when the newly born entity's first meeting took place. At that first meeting in Washington D.C., the main objectives, composition and organisational structure were approved. These remain, even today, the only terms of reference followed by the CGIAR. The main objectives were, and are, to:

- Examine the needs of developing countries for special efforts in agricultural research at the international or regional levels on critical subjects unlikely to be covered adequately by existing research facilities, and to consider how these needs could be met.
- Ensure the complementarity of international and regional agricultural research with national activities, and to encourage full exchange of information.
- Consider the financial and other requirements of high-priority international and regional research activities.
- Review priorities for agricultural research in developing countries on a continuing basis.
- Consider ways of assessing the feasibility of specific proposals.

An up-to-date list of CGIAR members (as of 2001) is presented in Appendix 2, and a map of the centres in Figure 1.

That same first meeting of the CGIAR in May 1971 endorsed a specific Bellagio recommendation to create a TAC consisting of a small number of "men of towering stature" in science. Their primary task was to advise the CGIAR on research priorities and their scope. The initial magic number of seven eventually grew to become a lucky 13, plus the Chairman, with equal representation from the developed and developing countries. The TAC secretariat was provided by FAO.

When the CGIAR was created, it took under its wing the four existing Centres, namely IRRI, CIMMYT, IITA, and CIAT. In his book, Warren Baum recalls that the *"early years*

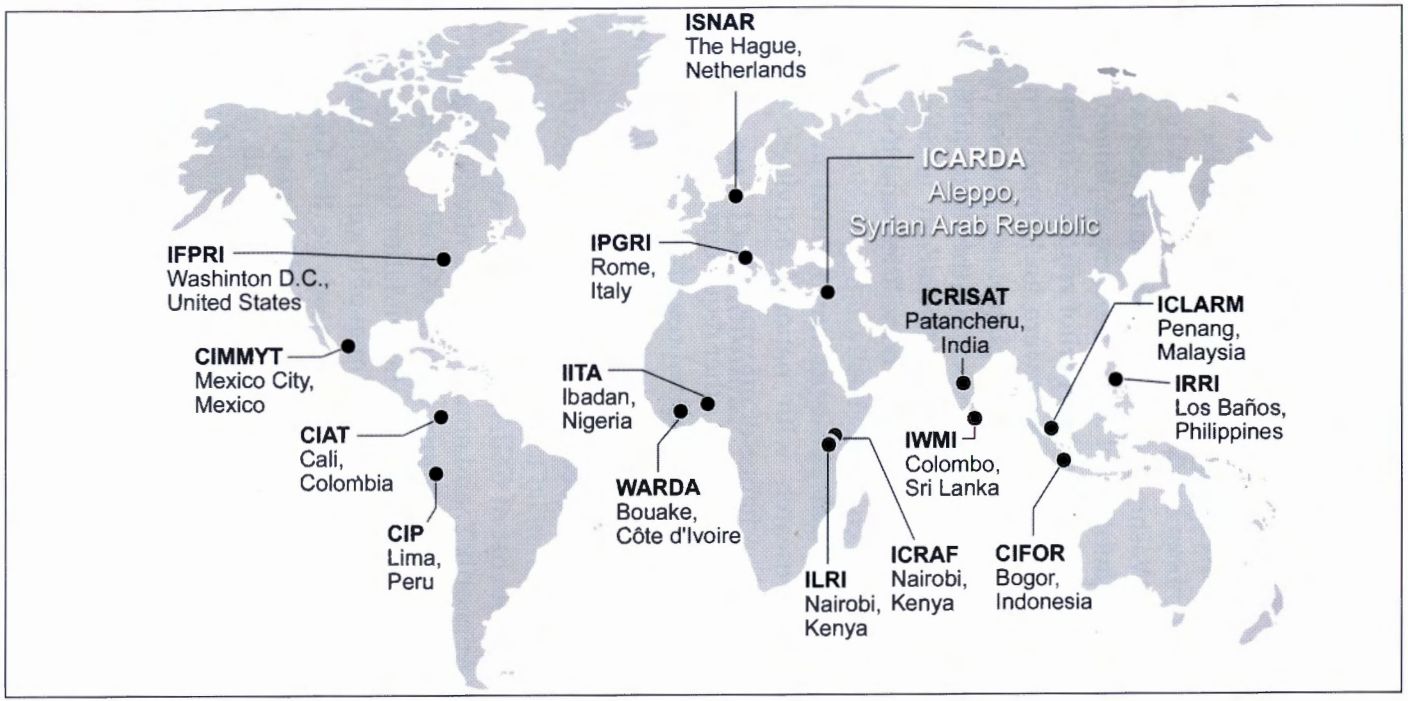

Figure 1. The CGIAR started in 1971 with four IARCs under its wing. In the last 25 years, the number has quadrupled. The map shows the strategic locations of those 16 Centres over the face of the globe; covering a vital range of research and training missions from cereals to farm animals and fish, from range to forestry, and from socioeconomics to natural resource management.

of the Consultative Group were marked by a rapid, almost explosive, growth in membership, in funds provided, and in the number of institutes and activities carried out under its auspices."[1] By the end of 1971, donors had grown in number to 11 and US$ 16 million had been pledged. By the end of 1972, the donors had become 16 and their pledges grew to almost US$ 19.5 million. Table 1 is rich evidence of what Baum meant by "almost explosive" growth. Within this scenario, ICARDA was conceived in the early 1970s, and entered the arena as a full CGIAR centre in 1977.

Table 1. Growth in CGIAR funding and staff 1972-76

Year	Donors	Grants (million US $)	Senior staff of the Centres
1972	16	19.5	133
1973	18	25.7	193
1974	20	31.7	250
1975	23	44.4	300
1976	26	58.0	324

Twenty five years later (2001), the CGIAR pledged US$ 340 million in support of 16 centres.

The CGIAR grew to become a group of representatives of donor agencies, eminent agricultural scientists and institutional administrators from developed and developing countries who guide and support its work through the IARCs, in conjunction with the relevant national and international bodies.

Recent Developments

We would be remiss if this chapter is closed without highlighting the ministerial-level meeting held in Lucerne, Switzerland, on February 9–10, 1995. This meeting tackled,

1 Baum, Warren C. 1986. Partners Against Hunger. Published for the CGIAR by The World Bank, Washington, D.C., USA. 337 pp.

among other matters, the syndrome of aid fatigue that had manifested itself as a reduction in the hitherto generous voluntary donor contributions to international organisations, including the CGIAR. When contributions and aid budgets began to shrink in the early 1990s, the centres had no option but to cut back on their own budgets. At first this was considered a harmless operation of trimming unwanted fat. Nevertheless, it was not free from pain. As the flow of funding continued to slacken, this budget-cutting operation generated danger signals for the system as a whole.

The alarm bell was decisively rung at the Lucerne Meeting by the then Chairman of the CGIAR, Dr Ismail Serageldin. He called for a renewal of the commitment to support the Group. The aim and purpose of his initiative was to clarify vision, refocus research agendas, reform governance and operations and urge renewed support for the CGIAR's international mission.

Hosted by the Swiss Government, the Lucerne Meeting was summoned by the three co-sponsors under the crisp title of *Sustainable Agriculture for Food Security in Developing Countries*. Despite the aid fatigue syndrome afflicting many quarters of the developed world, and especially those contributing to the United Nations (UN), the response of the CGIAR donors was both prompt and encouraging. The Lucerne Declaration had an immediate impact on the CGIAR funding, which jumped from US$ 269.6 million in 1995 to US$ 304.1 million in 1996; a significant US$ 34.5 million increase (CGIAR Annual Report, 1997[1]). In 2001, the CGIAR funding stood at US$ 340 million.

CGIAR Continues to Evolve[2]

A dynamic group like the CGIAR continues to evolve and the Lucerne Declaration was just one landmark in this

1 CGIAR (Consultative Group on International Agricultural Research). 1997. Nourishing the Future through Scientific Excellence: Annual Report 1997. CGIAR Secretariat, 1818 H. Street, NW, Washington, DC, USA.

2 Material for this section was drawn from the website of the CGIAR: www.cgiar.org.

process. A new landmark was reached at the International Centres Week, held on October 23-27, 2000 in Washington D.C., when the current CGIAR Chairman, Dr Ian Johnson, stated, *"The global environment, climate change, ecological and natural resource management, natural disasters, public health and nutritional concerns have all added new dimensions of complexity to the CGIAR's original focus on agricultural research for development. There is strong sentiment for change in the CGIAR. Current realities require the CGIAR to gear up for change, and such change must be reflected in both form and function."* It was at this meeting that it was suggested that the CGIAR centres be referred to as Future Harvest Centers.

Chairman Johnson noted that Future Harvest Centers are the central force of the CGIAR and should be at the forefront of the organisation. He outlined the following as the major challenges facing CGIAR shareholders and stakeholders:

- Maintaining science and research at the centers at the highest levels;
- Transforming the CGIAR into a "new age" institution characterised by lightness, agility, responsiveness and cost-efficiency;
- Strengthening the CGIAR's position as a producer of global public goods;
- Redefining a framework for partnerships;
- Keeping CGIAR funding stable and secure;
- Devising the most effective means of linking CGIAR research with national development programs.

Four Pillars of Change

The CGIAR Chairman reported that his intensive consultations with shareholders and stakeholders in a series of meetings had resulted in broad consensus on the following four "pillars of change":

- Adoption of a programmatic approach to CGIAR research, and endorsement of Challenge Programmes;
- Approval of an annual general meeting, and creation of an Executive Council;
- Transformation of TAC into a Science Council;

- Establishment of a System Office with an integrated communications strategy.

The consensus that emerged was:

1. Challenge Programmes
The CGIAR will incorporate a programmatic approach to research planning and funding to complement existing approaches and initiate the formulation and implementation of Challenge Programmes.

2. Executive Council
The CGIAR as a whole will meet once a year. The CGIAR will create an Executive Council, which will report to and carry out responsibilities delegated to it by the Group.

3. Science Council
TAC will be transformed into a Science Council.

4. System Office
The CGIAR will establish a System Office. A single, integrated communication strategy for coherent communication and fund-raising would be developed by the System Office, the centres and Future Harvest.

In concluding this chapter, it is obvious that a strong wind of change is currently moving the CGIAR—"The Best Show in Town"—into new and hitherto uncharted terrain. The "Best Show in Town" will continue to explore the new horizons of challenge, and will continue to develop new scenarios for science and technology to handle these challenges. Each centre will endeavour to maximize and sharpen its cutting edge to compete for resources and for excellence.

2

ICARDA is Born

ICARDA: An Historical Note

Let's imagine ICARDA as a living organism. It passes through the gestation stage (embryology) and at birth its configuration and shape is determined (morphology). It grows and develops in response to its inherited make-up (genetics) as well as nutritional input (nurture).

Numerous people, countries and international and regional organisations have contributed to these four phases throughout the first 25 years of ICARDA's life, and many continue to do so in its support. Without this continuous and dedicated upkeep we would not have today a fully-grown interactive and dynamic Centre that ICARDA is.

In the early years of the 1970s when missions came and went, and when recommendations on where to locate this seed were plentiful, and hence controversial, Syria was considered a likely possibility but with many caveats and even more competing alternatives.

The question where ICARDA was to be located, and whether it should be in one or more countries, was the most studied, difficult and, in certain respects, vexing issue to be resolved. As will be explained later, Lebanon was the uncontested first choice. In fact, the CGIAR decided in 1974 that the main headquarters would be located in Beirut. But, by then, the civil war in Lebanon had started.

During that period, which was fraught with political overtones and indeed civil war, one man took decisive action. It

came as an outright surprise; a happy relief to many; a numbing shock to some. He announced that one thousand hectares on a single site in the Aleppo region in Syria would be freely and unconditionally donated to the as-yet-unborn Centre—the site to be freely chosen by the appropriate international committee. The only person empowered to take such a sagacious and courageous decision within the sovereignty of Syria was President Hafez Al-Assad. In our judgement, the wise Chinese proverb "A good deed never ends" is thoroughly fitting. This single act was the determining factor in shaping the eventual morphology of ICARDA.

But now let's start at the beginning.

The Arid Lands Agricultural Development (ALAD) Programme (1968-1977): The Precursor of ICARDA

The Ford Foundation started this institution in 1968 in Lebanon with outreach sub-programmes in Egypt and Iran. The rationale was to serve non-irrigated agricultural ecosystems as typified by three experimental stations in the Lebanese Beka'a Valley. All three represented a semi-arid climate of winter rain (and snow), with a range of low to medium precipitation. There were activities in Egypt covering what was then referred to as mediterranean irrigated conditions of agriculture. In Iran, ALAD worked with cold rainfed climates, and there was a fourth initiative in Saudi Arabia funded by the Saudi Government.

ALAD collected and screened superior plant material (mainly maize, wheat, barley, sorghum, millets and rice) for high yield potential. Food legumes, principally chickpeas, lentils and faba beans, were also evaluated and, later, forage crops were included.

In addition, research at Terbol in Lebanon incorporated a sheep programme for improving meat and milk productivity levels in the famous Awassi breed common in the Levant region, which has been farmer-selected for hundreds of years. By 1973, after four years of research and crossing with Greek and Cypriot breeding stock, ALAD had developed

experimental Awassi animals that exhibited meat production potential of some 40% more than the native breed.

Unfortunately, all the improved Terbol sheep were lost during the early years of the Lebanese civil war. We can only trust they were much appreciated by their captors.

The second thrust of ALAD's work was to strengthen the capacity of national institutions in the region through what is now commonly known as human resource development programmes. And the third was to strengthen the network links between national scientists in the region and centres of excellence elsewhere.

There is rich evidence that this initiative taken by the Ford Foundation in the West Asia and North Africa (WANA) region shaped to a considerable degree the thinking and action of those who conceived and subsequently created ICARDA. The objectives of ALAD were almost exactly congruent to those advanced for the creation of ICARDA. Even now, more than 30 years since the Ford Foundation conceived and started its dynamic initiative, ICARDA's objectives are largely an expanded and advanced version of those of ALAD. Indeed, the chosen commodities, including sheep, are the same and the geographic coverage is identical. Recently, after the dissolution of the former Soviet Union, the republics of Central Asia (Kazakstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan) and the Caucasus (Armenia, Azerbaijan and Georgia) joined the original WANA family of nations covered by ICARDA.

However, the basic conceptual framework of networking and human resource strengthening still holds, even though considerably refined and expanded with the passage of time. ALAD emphasised the strengthening of socio-economic fabrics through steadily improved agricultural policies in the respective countries. This is still an ongoing activity of ICARDA, leading to the development of superior agricultural and management techniques.

Yet, there is a major strategic point of difference. ALAD's programme was created with the experience of hindsight from CIMMYT and IRRI that had produced the Green Revolution in the 1960s in Asia. At the time, it was thought

ALAD could transfer the Green Revolution to the WANA region through adaptive field experimentation. However, the WANA region has its own ecological features to which the irrigated agriculture experience of Asia cannot directly apply.

Rainfed farming patterns, elevations, new and important food commodities all differ. To address these basic realities, regional and global thinking gradually shifted towards the need to create a new international centre in the model of the CGIAR institutions. Thus ALAD was conceived by the Ford Foundation not as a centre like IRRI, CIMMYT or, later, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), but as a conduit through which knowledge and germplasm developed in IARCs are passed for the benefit of the WANA countries and even beyond. Furthermore, ALAD's basic mission of dryland research was expanded in the case of ICARDA to include a new initiative—studies of supplementary irrigation and efficient water use.

By December 1973, the ALAD programme was a dynamic and effective research/development entity in the WANA region. In full cooperation with the FAO Regional Programme, nurseries of wheat, barley, maize and other crops were sent, tested and reported back upon by almost all the countries of WANA and some beyond. IDRC of Canada joined in with two additional scientists for food legume and millet improvement.

Input from FAO

FAO's input began in 1960 when a three-man mission (Drs Norman E. Borlaug, J. Vallega and J.B. Harrington) toured WANA. They proposed setting up a project within the region for (i) testing the adaptability of the high-yielding Mexican wheat varieties and, (ii) having CIMMYT train young scientists from the region in wheat improvement and production. A UNDP-supported project was created for operation from the FAO Near East Regional Office in Cairo. The first (and last) manager of this project, Dr Abdul Hafiz, a Pakistani

national, was appointed in 1962 because of his scientific background and widespread professional contacts. After a rocky start, Dr Hafiz and his small team ran this project for nearly two decades (1962–1980). He expanded its activities to cover maize and sorghum, wheat and barley, in addition to training and seed testing. Geographical coverage was from Pakistan to Tunisia, to include 19 countries in WANA. The project worked in close collaboration with CIMMYT (in wheat and maize) and with ICRISAT on sorghum.

In time, the project - which became known internationally as the Hafiz Project—attracted large resources from many donors. Dr Hafiz stated that "for each dollar spent by UNDP, at least eight dollars were contributed by other donors." In recognition of his outstanding record of achievement, Dr Hafiz was honoured with the B.R. Sen Distinguished Award (FAO 1973). Its citation reads: "To Abdul Hafiz, whose service as an FAO field officer has made an outstanding contribution to the advancement of the countries to which he was assigned. His work in promoting cereal improvement and production in the Near East Region and in some of the countries of the African Region reflects both credit and honour on this Organisation (FAO) and on its partners in the field. In recognition of exceptional dedication and achievement, this acknowledgement is gratefully presented."

Of all the UN bodies concerned with basic food needs, socio-economic issues and constraints, the FAO has been the most sensitive and sensitising body at the international level. It must thus be recognised as a major driving force of that era for the creation of ICARDA to serve the region. This is brought out strongly in the Skilbeck Mission Report. The first three paragraphs of the opening statement in the Report's Chapter One, entitled *Background and Terms of Reference*, are quoted here verbatim to underline this viewpoint:

"1. *In recent years there has been increasing concern at the deficit in food production in the countries of the Near East and North Africa despite the national agricultural development programs and the considerable aid which has been forthcoming from bilateral and multilateral agencies.*

2. *In 1969 at an International Conference on Mechanised*

Dryland Farming convened in Moline, USA, there was a request for FAO to create an Institute for the Development of the Semi-arid Zones. At the 10th FAO Near East Regional Conference held in Islamabad in 1970, particular stress was laid on the need for intensified agricultural research on the major food crops of the region. Further resolutions were passed relating to the need for intensified research on food crop production and on the more efficient use of water resources at the 11th Regional Conference held in Kuwait in 1972.

3. *At that Conference the following resolution (No. 8/72) was recorded:*

   (The Conference) recommends the Technical Advisory Committee Mission to determine the necessity of establishing an internationally supported research institute in the region to carry out basic research on some important food crops in the region, with greater emphasis on rainfed areas as well as to provide training facilities for young scientists of the region."

The Skilbeck Mission

Early in 1973, CGIAR's TAC sent a seven-man mission to explore the possibility of creating a centre in this region. In June of that year, the mission submitted its report *Research Review Mission to The Near East and North Africa* to TAC. Like all such notable documents that constitute a watershed line of division, it became known by the name of the Mission's leader as 'The Skilbeck Report.' Dunstan Skilbeck, a well-known academic, who was at one time principal of the University of London's Wye College in the UK, lived to see his Mission's basic recommendations adopted to a substantial degree.

Naturally, there were modifications and adjustments as the report was enacted. One of these changes was in the name proposed by the mission for this new centre. It had opted for the International Research Centre for Mediterranean Agriculture (IRCMA). A few other names were proposed before acceptance of the "International Center for Agricultural Research in the Dry Areas (ICARDA)." This change happened, of course, neither

through indolence nor idleness. A short story relates how an alternative second name came to stick tentatively before the final ICARDA designation was adopted. That intermediate title was the International Centre for Research in Arid Lands (ICRAL).

TAC Takes Over

As stated earlier, TAC took full note of the Skilbeck Report, but naturally made several changes. At a February 1974 meeting of TAC, the title IRCMA was dropped in favour of ICRAL. Reports of the Seventh and Eighth Meetings of TAC richly reflect the intense debate that took place on the need for a centre of excellence to serve WANA, to catalyse the loose network of national programmes and to maximise the assets of the pre-existing IARCs, particularly CIMMYT on wheat and ICRISAT on food legumes. But to the proposed title, ICRAL, there were still strong objections.

The story goes on to say that one member of the TAC Working Group, Dr Hassan El Tobgy, then a staff member of ALAD program, strongly contested the appropriateness of the proposed names, IRCMA or the more generic title ICRAL. An eminent scientist and a distinguished administrator from the region, Dr El Tobgy held a number of prominent positions, including that of First Under Secretary at the Ministry of Agriculture in Egypt, and he moved in high circles of international agricultural research within the region and beyond. Accordingly, his point of view was always listened to with respect, especially when it pertained to this so-called Near East region. In the Working Group's discussion, Dr El Tobgy opposed the name ICRAL because he considered it did not reflect the geographic coverage of the Centre. Instead, he put forward the International Research Centre for Agriculture in the Dry Areas (IRCADA) By the end of the day, the supporters of the names originally proposed were out-numbered. The Tobgy proposal was adopted by the Working Group, and finally by TAC and the CGIAR. The verdict of TAC can be read in the following paragraph from the Report of its Seventh Meeting (Rome, February 1974, para. 67).

"The recommendation that a strong international research centre be established in the region with Consultative Group support was therefore endorsed by the Committee; although members were generally unhappy about the titles suggested for it, whether by the Skilbeck Mission or at subsequent occasions. Objections were raised to the inclusion of the term "Arid Lands" or "Arid Zone" in the title. Not only would this clash with ICRISAT and the regional Institute for Arid Zones (ACSAD), but there was a general consensus that it was inaccurate as applied to the agroecological areas under consideration. The use of the word "Mediterranean" was also disliked by some members, both because parts of the region fell outside the zone of the Mediterranean climate, and because the Working Group wished to avoid giving a narrowly regional connotation to a centre whose work might have much wider application geographically. A title clearly expressing its role was preferred. After discussion of several possible titles and their acronyms the committee decided tentatively to accept "dry areas" as being most descriptive of the probable focus of the Centre's work, and the title "International Research Centre for Agriculture in the Dry Areas" (IRCADA) was suggested. It was agreed that this, together with alternatives which might be proposed in the interim, would be discussed further at the July Meeting."

Under the chairmanship of Dr David Hopper, who later became President of IDRC and subsequently Vice President of the World Bank, a CGIAR subcommittee met in London (August 1-2, 1974). It produced proposals distilling fewer subjects to form the 'mandate' of the new Centre, and opted for a centre of excellence to be created. This CGIAR subcommittee again discussed the full range of options and finally decided on ICARDA (International Center for Agricultural Research in the Dry Areas) as the most fitting and appropriate name.

The Seventh and Eighth TAC Meetings, held in February and July 1974, respectively, under the chairmanship of Sir John Crawford, endorsed the working group's proposals, name and all. TAC's recommendation, that a new IARC be created under the name ICARDA, then went to the CGIAR Centres' Week meetings in July 1974. At this point it was being recommended that the new Centre be located in Lebanon.

It has already been noted that the Ford Foundation, later assisted by IDRC of Canada, had operated an effective regional agricultural development programme (ALAD) since 1968. Its ongoing research and training activities were stationed in the Beka'a Valley in Lebanon. Collaborative programs with NARS in WANA had been started in the early seventies on the improvement of barley and wheat, cool-season food legumes and forages. Germplasm collections (referred to as Near East Collections) were initiated in cooperation with the national programmes of the region, with the support of the Ford Foundation and the IDRC.

Human resource development activities were also started as integral parts of ALAD. The programmes on cereals, food legumes and forages were transferred to ICARDA in 1977, including all ALAD staff (administrators, scientists and support staff), germplasm and physical resources, in addition to the collaborative programmes already established in WANA. As a result, the new ICARDA staff were well aware of the needs of the region and the service provided to NARS.

Furthermore, when the Skilbeck Mission visited the region's countries and institutions, they met ALAD's Director Dr Robert Havener and nine other high calibre international staff, all stationed in Lebanon. No wonder, therefore, that all the actors on the stage—members of the Skilbeck Mission, TAC and its subcommittee, the CGIAR and the ALAD staff—came to favour Lebanon as headquarters for the new Centre.

It would be simplistically unreal, however, to review this critical formative stage without mention of the painstaking studies at the outset when the Skilbeck Mission was fielded. The constitution of that body alone bears witness to the seriousness with which TAC and the CGIAR undertook the endeavour. The exercise was conducted by seven eminent men (sadly no women) from Italy, USA, Australia, the Netherlands, Palestine [sic] and France, plus, of course, the mission leader from the UK, within a framework with exacting terms of reference.

Prior to this, ICRISAT had been established by the CGIAR to cover the semi-arid tropics; an act which brought out more clearly the need for a sister centre to cover the ecosystem of

the new ICARDA region. Working with ALAD, CIMMYT covered wheat and maize in this region under the umbrella of a 'global' mandate. Similarly, ICRISAT, working with ALAD, covered chickpea. Nevertheless, that coverage was insufficiently concentrated. And then there were other basic food crops as well as livestock which were not covered at all by international centres. So, the need for another centre in the WANA region was naturally felt and articulated through several discussion fora which ultimately led TAC to field the Skilbeck Mission.

However, the basic question still remains unanswered as to which body first proposed the creation of an International Centre to serve the region, then called the Near East/Middle East.

As mentioned earlier, the ALAD center and the FAO had heightened regional and national awareness of basic food deficits and the need to address the challenge through application of an active research and training thrust. So did—if to a lesser extent—other national, regional and international activities dealing with the scientific as well as the socio-economic bottlenecks afflicting WANA. The main topics of study were:

- Water as a receding commodity calling for its judicious use
- Aridity and the increasing need for complex crop/livestock integration
- The increasing basic food gap between production and consumption.

These and many other complex factors have dragged down the once-famous Fertile Crescent, which was for centuries the granary of Europe, to become the highest per capita basic food importer in the world. The League of Arab States and its specialised agencies also addressed these issues, most notably the Arab Centre for the Studies of Arid Zones and Drylands (ACSAD), the Arab Organisation for Agricultural Development (AOAD) and the other agencies dealing with socio-economic affairs. So did the relevant national institutions, including governments and universities. It was ALAD, followed by FAO, that made the most significant contribution in the decade preceding the birth of ICARDA.

A Place to Call Home

The Skilbeck Report went into considerable detail on the issue of location. It concluded that: *"Within the Near East, it was still a difficult task to determine an optimum location, but after much discussion it was resolved to recommend Lebanon as the most suitable country and that, if located there, the Centre should be placed at an appropriate site in the Beka'a Valley. It was understood that the Government of Lebanon would look favourably on the suggestion that it should provide facilities for the Centre, but there was no opportunity to assess the possibility of it being specifically located in the Beka'a. The existence of the Ford Foundation in Beirut and its ALAD Centre in the Beka'a would provide a starting point . . . . ."* (Skilbeck Report, para. 181). The report envisaged that a Centre established in Lebanon should absorb the main elements of ALAD's programme since these would form the most important components of its future work.

TAC carried out an exhaustive country-by-country search with the aim of obtaining a rational set of location choices for the proposed Centre, based on the cardinal physical and biological parameters. The most enlightening reference on this subject is the Secretariat Note to the TAC's Eighth Meeting (July 24-August 2, 1974) which painstakingly elaborates on the Skilbeck Mission report. A short quotation (see below) from that Secretariat Note reveals the scope and depth of the studies undertaken to guide the CGIAR to a decision. The two conclusions of that note seemingly set the cast on where the ideal location should be. Little did they know then, nor even later when Lebanon was initially selected, that expediency normally wins! The timeliness of the Syrian offer (referred to at the onset of this chapter) was so unexpectedly lucrative that it shifted the 'mood' of thinking almost decisively in favour of the new site in Syria. Subsequent events—mainly the war in Lebanon—clinched the decision; ICARDA thinking moved perceptibly towards Aleppo and to Tel Hadya as the headquarters, with Lebanon as the second Principal Station and Iran as the chosen location for highland research.

The Secretariat Note made an exhaustive study of the main agricultural soils and climatic configuration of Algeria,

Syria: ICARDA's Host Country

Syria is a unique country of startling but pleasant contrasts. An ancient land of ruins, time-worn monuments and age-old traditions, Syria is also a bustling, energetic republic well along the road to modernisation and development.

Syrians are well-acquainted with the ways of the West, but still cherish their traditions and customs. It is this unique blend of old and new, familiar and exotic, continuity and change, that every first-time visitor senses.

The Citadel of Aleppo

Aleppo, said to have been founded over 5000 years ago, is the second principal city of Syria, after Damascus. Situated in the northwestern part of Syria about 48 km south of the Turkish border, Aleppo is located at the crossroads of great commercial routes dating back to the 2nd millennium BC. It lies about 100 km from the Mediterranean Sea to the west and the Euphrates River to the east.

The city's Arabic name, Halab, is of ancient Semitic origin and is first mentioned in texts of the cuneiform tablets of Ebla (Tel Mardihk) in the 3rd millenium BC. In the 18th century BC Halab was the capital of the Amorite kingdom of Yamkhad, and it subsequently came under Assyrian, Hittite, Egyptian, Mitannian, and again Hittite rule during the 17th-14th century BC. In succeeding centuries it achieved some independence as a Hittite principality. It was conquered by the Assyrians in the 8th century BC, and then fell into the hands of the Seleucids, who rebuilt it and renamed it Beroea. It became a first-ranking city of the Hellenistic period and a great commercial entrepôt between the Mediterranean region and the lands farther east. The city was absorbed into the province of Syria in the 1st century BC. It prospered under Byzantine rule but was pillaged and burned by the Persian Sasanian king Khosrow I in 540. In 637 the city was conquered by the Arabs, under whom it reverted to its old name, Halab. In 1260 Aleppo was taken by the Mongols, who massacred its inhabitants. Soon after, and for several centuries under the Mamluks, the city was incorporated into the empire of the Ottoman Turks under whom it underwent a remarkable commercial revival, becoming the principal market in the Levant. Its prosperity continued until the 18th century and full economic recovery came in 1880 with the arrival of the railroad. In the 20th century the city became an industrial centre rivaling Damascus.

The Citadel, originally the town's acropolis, is integral to the history of Aleppo. No deep excavations have been carried out to reveal its ancient history; but archaeologists have unearthed a Hittite temple dating from the 9th century BC, and found Roman and Byzantine artifacts and cisterns dating back to the time of the Emperor Justinian. The Citadel in its present form dates from the era of the king Al-Zaher Ghazi, who renovated the city walls in the 13th century.

Iran, Iraq, Lebanon, Syria, Tunisia and Turkey. It indicated to TAC that:

"There is no single country in which an International Agricultural Research Centre would be able to conduct a program representative of the entire range of climates, soil, and resultant agricultural usage in the Near East and North Africa. Several countries were potential candidates for hosting the Centre. However, and despite the keen competition, the decision was to proceed to establish ICARDA with a headquarters in Syria and cooperative research agreements with many countries in the region.

The second conclusion is that no additional technical evaluation seems likely to produce a more definitive answer as to in which country the headquarters of the proposed research centre ought to be located; since it is bound to require at least one associate centre in another country to be adequately representative."

End of the Beginning

We have already gone into much detail on the complexity of ICARDA's genesis. Yet there is still more that can be said on the hard political realities which circumscribed the first few formative steps. Suffice to relate that, first, we had a devastating civil war in Lebanon; second, the still prevailing high tensions among the countries in the region were similarly acute; third, Iran had experienced a dramatic change in leadership and governance; fourth, Syria's relations with the West, especially the USA and the UK were certainly less than ideal and, hence, fifth, ICARDA, being almost exclusively created and nurtured by Western funds, was perceived by some at that time like transplanting a heart into an unreceptive body! Yet, the offer was too lucrative to reject!!

When the scores of farmers were being dispossessed—albeit with generous government compensation—of their little and large holdings on the one thousand hectares farm of Tel Hadya, their reaction was violent, of which more later. The story going the rounds was that "an American company (in Arabic: *Al Sharika Al Americania*) has invaded the outskirts of Aleppo!" This name lingered on from that early (and somewhat tense) beginning for a long time afterwards.

In closing this chapter, let's return to the beginning where we imagined ICARDA as a living organism. Of its morphology, much has been said, and a fair portion of this chapter has covered its embryology up to birth—from the FAO project and the ALAD program through to the FAO Regional Conference, and the Skilbeck Mission report and onwards. Based on its inherited make-up, the CGIAR—with its generous donors almost exclusively from the industrialised West—richly deserves to be thanked for placing ICARDA on the map as its thirteenth centre.

Finally, and surely, most importantly on this score, are the external financial resources as well as the concomitant checks and rules; namely, governance. More precisely, who are the providers of the annual budgets from ICARDA's inception until today? What stimulates them to make their pledges and how is the mechanism, in part or in totality, controlled? All these and other issues will be covered in some detail in the following chapters. But before we delve into all this, let us have a first look at ICARDA's early years.

3

The Early Years

Missions came and went from the region. Committees and subcommittees met repeatedly to fine-tune recommendations on all aspects leading to the birth of the 13th International Centre of the CGIAR. From that painstaking process, the mandate of ICARDA gradually emerged. One set of its tasks comprised undertaking pioneering research and relevant training on a selected number of *globally-mandated basic food crops*; a term that came to be standard in the CGIAR vocabulary, and which characterises the specific crop(s) designated for the corresponding IARCs in the CGIAR family. Those globally mandated to ICARDA are barley, lentil and faba bean. Two other food crops—wheat and chickpea—also basic to the needs of the region, were already mandated to two other centres; namely, wheat (soft as well as durum) to CIMMYT and chickpea to ICRISAT.

This region has long been described by the UN as the Middle East and North Africa, or more nebulously, as the Near East. The more objective geographic definition is West Asia and North Africa (WANA). ICARDA adopted this description (and acronym) at infancy to refer to its regional bounds from Pakistan to Morocco, including all the Arab countries as well as Cyprus and Turkey, and south to Sudan.

Most recently, since 1995, and subsequent to the dissolution of the former Soviet Union, the independent republics of Central Asia (Kazakstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan) and the Caucasus (Armenia, Azerbaijan and Georgia) joined ICARDA and became part of

the Centre's regional geographic mandate. The inauguration of this historic event took place in Tashkent, Uzbekistan, on December 5-9, 1995 and was attended by Dr Adel El-Beltagy, Director General of ICARDA, and several other senior staff members. During that meeting, a cooperative agreement was signed between ICARDA and the five countries of Central Asia.

Links with CIMMYT and ICRISAT

A collaborative mechanism was put in place to dovetail the research foci of ICARDA with those of CIMMYT and ICRISAT in an endeavour to minimise undue overlapping. To achieve this, and almost from the inception of the Centre, both CIMMYT and ICRISAT sent outpost staff to ICARDA headquarters, primarily to handle genetic components of the research. An annual work plan is agreed upon *a priori* between ICARDA and each of the two Centres. With the passage of years, experience at the working level ironed out most, if not all, of the tension that was bound to occur when two or more organisations with similar vested interests are charged with undertaking similar tasks. The most recently signed agreement between ICARDA and CIMMYT is a vivid testimony to the gradual and, at times, delicate process of synchronisation.

However, genetics apart, ICARDA was assigned overall responsibility at the regional level of all the other research components of wheat and chickpea as well as for other crops. Furthermore, ICARDA was assigned by the CGIAR the regional responsibility for pasture crops, with emphasis on rangeland improvement and small ruminant management. In effect, it was made responsible to the CGIAR for the socio-economic parameters which were collectively described by the all-embracing term: farming systems. The reader can hardly do better to understand the status quo than read the text currently used to introduce ICARDA in almost all its published material. It goes as follows under the title *About ICARDA*.

About ICARDA

"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), 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's mission is to improve the welfare of people through agricultural research and training in the dry areas in the poorer regions of the developing world, by increasing the production, productivity, and nutritional quality of food to higher sustainable levels, while preserving or improving the resource base. ICARDA meets this challenge through research, training, and dissemination of information in partnership with the national agricultural research and development systems.

The Center has a world responsibility for the improvement of barley, lentil, and faba bean, and a regional responsibility in Central and West Asia and North Africa for the improvement of wheat, chickpea, forage, and pasture crops – with emphasis on rangeland improvement and small ruminant management and nutrition – and of the farming systems associated with them. 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 Central and West Asia and North Africa.

The results of research are transferred through 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 and these efforts are supported by seminars, publications, and specialized information services.

First at the Helm—IDRC

A concise text on the history of ICARDA's inception through to its birth is written in a short essay so densely packed with spotlight information that it, in itself, constitutes a basic document. Entitled *The History and Development of the International Center for Agricultural Research in the Dry Areas (ICARDA) up to January 1976*, it was written by W.D. Daniels of the International Development Research Centre (IDRC). The last page lists *Events in the Evolution of ICARDA*. From then on, and until the Board of Trustees was established in 1976, IDRC was officially assigned the responsibilities of Executing Agency. In effect, this was the watershed line when governance began.

Lunch for the first Board of Trustees in 1978. This building was a farmer's house (swimming pool in foreground), and was part of the land acquired for ICARDA's Tel Hadya farm. The building still exists.

Joseph H. Hulse was, at the time, IDRC Programme Director of Agriculture, Food and Nutrition Sciences and Vice President, Research Programmes. He represented IDRC, as the Executing Agency (EA), until it handed over government of ICARDA to the first formed Board of Trustees. He writes:

"In 1976, I persuaded Dr Omond Solandt, Canada's most distinguished scientist to act as Senior Consultant to EA and embryonic ICARDA. Solandt, recognized as one of the world's leading authorities on systems research, was architect and chair of the most extensive and scientifically diverse research organization ever created in Canada, with eight research centers spread from the

Atlantic to the Pacific, which included inter alia *oceanography, advanced electronics, communications systems, climatology, human physiology, food science and nutrition. Solandt's unique experience in integrating several research centers into a cohesive whole was particularly relevant to the original plan for ICARDA with its headquarters and principal research station in Lebanon, an elevated altitude station at Tabriz, Iran and a supporting facility in Syria.*

The EA negotiated formal agreements with, and promises of financial support from each of the governments, including selection of the land for a research station close to Tabriz. Subsequent political perturbations in Iran and Lebanon rendered the original plan impossible of realization and significantly delayed ICARDA's effective establishment. Eventually a renegotiated arrangement moved the headquarters and principal station to Aleppo. It is believed that IDRC's established support for agricultural research in Syria and neighboring countries was not unhelpful in negotiations with the Syrian government.

The EA defined ICARDA's legal personality and formulated its constitution; drafted a budget and accounting procedure and, with the Ford Foundation, organized an orderly transfer of ALAD facilities and property to ICARDA. Since ALAD was a Ford Foundation project, and ICARDA was to be an international center financed by a consortium of mainly national governments, the constitution and ALAD's accounting procedures were significantly modified to satisfy the altered responsibilities and legal personality. The EA acted as administrator of the process by which the first Board of Trustees and Director General were appointed. Then it handed over its responsibilities to both respectively".

Events in the Evolution of ICARDA

1. The Third Meeting of the Technical Advisory Committee, Rome, April 10–13, 1972.
2. The Skilbeck Mission, March–April 1973.
3. The Sixth Meeting of the Technical Advisory Committee, Washington D.C., July 25–August 3, 1973.
4. The Working Group, Rome, November 1973.
5. The Seventh Meeting of the Technical Advisory Committee, Rome, February 1974.

6. The Eighth Meeting of the Technical Advisory Committee, Washington D.C., July 24–August 2, 1974.
7. International Centres' Week, Washington D.C., July 29–August 2, 1974.
8. The Preparatory Committee of the Consultative Group for the establishment of an international centre for agricultural research in the Near East and North Africa, London, England, October 1–2, 1974.
9. The Consultative Group Meeting, Washington D.C., October 30–31, 1974.
10. The First Meeting of the Subcommittee on ICARDA, Rome, February 10–11, 1975.
11. The Second Meeting of the Subcommittee on ICARDA, Washington D.C., June 6, 1975.
12. The Third Meeting of the Subcommittee on ICARDA, Washington D.C., July 30, 1975.
13. International Centres' Week, Washington, July 28–August 1, 1975.
14. The Fourth Meeting of the Subcommittee on ICARDA, Washington D.C., October 29, 1975.
15. The Consultative Group Meeting, Washington, October 30–31, 1975.

The CGIAR Subcommittee on ICARDA

This was formed by the CGIAR in 1974 and held its first meeting in February 1975. The CGIAR appointed a most distinguished Canadian—Dr David Hopper—as its Chairman. Soon after that he was appointed by the Canadian Government as President of IDRC, and subquently Vice-President of the World Bank.

Summary Record of the First Meeting of the Subcommittee on the Establishment of an International Centre for Agricultural Research in the Dry Areas (ICARDA) as Approved by its Chairman, Dr David Hopper, March 19, 1975

The Subcommittee was set up following the October 1-2 meeting of the Preparatory Committee of the Consultative

Group, its terms of reference were endorsed by the CGIAR meeting of October 30-31, 1974 (Appendix 3). The first meeting took place at FAO headquarters on February 10-11, 1975 with Dr David Hopper, by then President of IDRC, as chairman.

Present were representatives of the following 14 CGIAR members: the three co-sponsors (FAO, UNDP and the World Bank); Australia, Belgium, Canada, Federal Republic of Germany, Ford Foundation, France, IDRC, Netherlands, Rockefeller Foundation, United Kingdom and the United States. Mr John Coulter of the Consultative Group Secretariat acted as Committee Secretary. A list of participants is given in Appendix 4.

Chairman's Progress Report on Activities Following the Preparatory Committee Meeting

Facilities in Syria and Lebanon: *Accompanied by officials of the Government of Lebanon, the Chairman had made an extensive tour of the Beka'a Valley that confirmed the need for additional land in Syria, particularly for farming systems work. The land offered in Lebanon included the station at Tel Amara, but the Chairman agreed with several delegates that, on principle, the station should not be taken over because the national programme in the Lebanon could be seriously affected. He did regard this, however, as an indication of goodwill from the Government of the Lebanon. Land adjacent to this station could, however, be made available.*

He had received an excellent reception in Syria and thanked Dr Nour for the way in which the FAO Regional Conference had prepared the way. Syria was prepared to offer 500ha of irrigated land and 1,000ha in a low rainfall area, probably in the Aleppo Plain; and land might also be available in the new Euphrates irrigation scheme. In both countries he had talked to senior Government officials and scientists, with the Syrian Government expressing the hope that the part of the Centre to be in Syria could be closely coordinated with the Lebanese wing.

The Chairman explained Syrian misgivings about the role of the wing of ICARDA in Syria. It was feared that it would have a rather minor role in the Centre as a whole, but he had reassured

them that the work there would play a key role in the Centre's activities, even though the major laboratory facilities would be in Lebanon. To ease communications with Syria, he had agreed the Director General of the Centre would have an office in the Syrian wing, and that there would be a Deputy Director General at the Syrian station in charge of day-to-day administration and available for direct contact with Syrian Government officials. Several delegates stressed the need to reassure the Syrian Government that work there would be in equal partnership with that in Lebanon, and welcomed the Chairman's statement on this.

How could they have guessed that the civil war in Lebanon would soon overturn this scenario completely and that there would only be ONE wing at Tel Hadya, Aleppo.

Welcome for the Centre in Countries of the Region

The Chairman outlined his visits to Egypt, Sudan, Saudi Arabia, Oman and Kuwait. He had also visited Iran. He had contacted Ministers and scientists in these countries and he assured the meeting that the latter were being brought fully into the discussions. Every country had given a warm welcome to the formation of an international centre in the region. Egypt and Sudan were mainly interested in irrigated agriculture, and hoped that more attention could be given to on-farm water management. Kuwait and the Sudan were interested in desert management and desert encroachment into agricultural zones. Saudi Arabia, in addition to its concern about desert areas, was interested in oasis development, and it had a large unused laboratory for which it sought proposals. Contacts were also made with the Arab Center for the Studies of Arid Zones and Dry Lands in Damascus, and the Arab League Development Programme in Khartoum; the Jordanian Ambassador in Beirut had also been contacted with a view to a future visit to Jordan.

In addition to discussions on the programme of the proposed centre, the Chairman said that, at the suggestion of the Chairman of the CGIAR, he had issued an invitation to Saudi Arabia and Kuwait to join the CGIAR as donor members. To inform them of Group activities, he had distributed copies of the CGIAR Brochure, of which 1,000 copies had been printed in Arabic. Both countries

were willing to send observers to next Centres' Week; Kuwait had sent an observer to the February meeting of TAC. Saudi Arabia indicated that any contribution to the CGIAR system would come through its contributions to "international food activity."

The Chairman told the meeting that Mr Graves of the CGIAR Secretariat had visited Algeria, but that he himself had not been to North Africa. Germany's delegate emphasised the importance of North Africa, pointing out that Tunisia had a high level of scientific talent, and could serve as a potential host for a station. The Chairman said that, while an associate station in Algeria had been regarded as important, the TAC now considered that further developments there could be delayed until the development of the facilities in Syria and Lebanon. The proposed station in Syria could provide ecological conditions similar to those in Algeria. TAC could review the need for an associate station in Algeria with the Board of Trustees of ICARDA at a later date.

From then on the Syria/Lebanon scenario became dominant. ICARDA had thus been officially launched.

The Tool Shed Option

Throughout the phases of its conception and early stages of development there was a persistent feeling—if not a tacit assumption—that ICARDA must be substantially supported financially by the oil-rich countries of the region. There was the notion held by several members of the CGIAR that ICARDA was dissimilar to its 12 older sisters since it was to be located in the heart of an oil-rich environment. Accordingly, the CGIAR secretariat should be securing petrodollars to flow into the CGIAR to support at least the ICARDA permanent buildings; and better still to support the CGIAR as a whole. The CGIAR subcommittee discussed alternative scenarios at great length. As Ralph Melville, from the UK, aptly put it, the most likely alternative course being to launch ICARDA initially on what he called the "Tool Shed Model." Until substantial donations from within the WANA region were secured, the CGIAR's limited funds would support ICARDA's operational budget and temporary tool shed buildings at Tel Hadya as well as rented premises in Aleppo.

If funds came from the region, then the tool-shed facilities would be used for other purposes, and a qualitatively different and highly sophisticated physical facility would be built along the lines of other CGIAR international research centres.

Crossing the Threshold

A Trust Fund for ICARDA: By early 1975, the CGIAR with the full backing of TAC, supported the creation of ICARDA and requested Dr Robert Havener, Director of ALAD, to prepare a budget for the start-up operation. The CGIAR called for donors to contribute. Thirteen countries and organisations made the first bid (Table 1):

Table 1. First donors to ICARDA

	US$
Australia	25,000
Belgium	25,000
Canada	25,000
Ford Foundation	25,000
France	25,000
Germany	25,000
IDRC (Canada)	50,000
International Development Association	25,000
The Netherlands	25,000
Rockefeller Foundation	25,000
UK	25,000
UNDP	25,000
USA	50,000

The threshold had been crossed; donors were in full evidence and with tangible commitment. However, all the donors were from West Europe and North America. The same tantalising question continued to hover. Where is the contribution of the oil-rich countries of WANA for whose direct benefit (as well as their poorer relations) ICARDA was to be created? TAC and the CGIAR incessantly asked that question right from the start until the happy breakthrough came from the Organization of the Petroleum Exporting

Countries (OPEC) Fund for International Development and the International Fund for Agricultural Development (IFAD). A full account of that breakthrough is related in the Governance, Finance and Buildings chapter.

In Search of Regional Funds

Early in 1975, the Chairman of the CGIAR (Warren Baum) and the Chairman of the Subcommittee (David Hopper) on the establishment of an International Centre for Agricultural Research in the Dry Areas visited a number of countries in the WANA region, including Iran, Saudi Arabia and Kuwait in search of new donors nearer ICARDA's home. Iran was, *inter alia*, more supportive, hoping to secure a centre run by ICARDA located in the country's high altitude zone. It made financial pledges—and honoured them—to some CGIAR centres, including ICARDA, for two years (1976–78). Baum, in his book *Partners Against Hunger* (page 90), adds this further information:

"Saudi Arabia, Iran, and the Arab Fund for Economic and Social Development (AFESD), based in Kuwait, did become donor members. Saudi Arabia made grants, limited to ICARDA, for 1976 and 1977; Iran made grants to several CGIAR research programmes, including ICARDA, for the years 1976–78; and the Arab Fund became a regular donor beginning in 1977. The International Fund for Agricultural Development (IFAD) and the OPEC Special Fund became members of the Group in 1979 and 1980, respectively, and Saudi Arabia again became a donor in 1982."

This search for more and new sources of funds continues, and is becoming more acute with the passage of years, a subject broached in more detail in a later chapter.

Absorbing ALAD into ICARDA

In November 1975, IDRC of Canada in its capacity as the Executing Agency signed an agreement with the three co-sponsors (the World Bank, UNDP and FAO) on behalf of the CGIAR. That agreement became the legal umbrella under which ICARDA was created.

Based on this agreement, ICARDA became a legal entity incorporating three sub-centres. The headquarters was located in Lebanon, and the first Director General, Dr Harry S. Darling, was appointed in 1976 and stationed in Beirut in 1977. Farm operations were conducted on Terbol farm (39 hectares) in the Beka'a Valley and Kfardan (50 hectares). The second sub-centre was on the outskirts of Aleppo on land expropriated by the Government of Syria mainly from three sister villages: Barkoum (222 ha), Kessebia (212.5 ha) and Tel Hadya (502 ha). The name Tel Hadya was adopted by ICARDA for this sub-centre because of the imposing hill (*tel* in Arabic) around which the farm operations were conducted. The third sub-centre was in Iran at Tabriz (1200 hectares proposed). However, from the outset, the birth of ICARDA was a singularly difficult one. To be born in the first place, with three centres in three locations, was most unusual for the CGIAR. All the older 12 centres started with one location only, and proliferated into two or more sub-centres as their work developed and as needs dictated. ICARDA, though, was a centre in search of a home.

Almost as ICARDA was being born, savage social unrest erupted in the region. Within months, in 1975, Lebanon plunged into a fierce bloody civil war. This coincided with the plans well under way to absorb ALAD (then in Lebanon) into ICARDA; staff, germplasm, vehicles, equipment, experience and all. Under those tense circumstances, crisis management prevailed. ICARDA's first Director of the Syrian Station (Tel Hadya), Dr Owen L. Brough, who was absorbed from ALAD, wrote a comprehensive *Early History of ICARDA* in which he set out the chronology:

"By June 1976 all the ALAD staff was located either in Egypt or Syria. The Beirut airport was closed in mid-June 1976. Lebanon ceased to be a base for ALAD operations and Egypt became the ALAD (ICARDA) administrative centre.

In late 1975, Robert Havener moved on to a position with the Ford Foundation in New York and I (Owen L. Brough) became Director of the ALAD programme.

In late 1976, an office was set up in Aleppo and more and more of the administrative matters were handled there. ALAD staff was

still located in three countries and I spent much time moving between these locations.

In March 1976, Dr Harry S. Darling was appointed as Director General of ICARDA but was to remain in England until June 1977, and then he established his office in Beirut at the request of the Lebanese Government, one of the countries that signed the Agreement.

On January 1, 1977, Dr Darling appointed me (Owen L. Brough) as Assistant Director General for Administration of ICARDA and Director of the Syrian station. On that same date, I negotiated appointment letters for all local and national staff located in Aleppo, Egypt and Jordan, and Dr Darling signed appointment letters for all the Senior International Staff located in all locations. At that time there were seven international staff members and about 35 local and national staff."

From then onwards the excellent work of ALAD, done under the leadership of Dr Havener (and later briefly by Dr Brough), was handed over smoothly to the new institution. Despite all the turmoil of a civil war in Lebanon, that phase of dovetailing was brilliantly—some might say, miraculously—executed.

The senior staff members from ALAD became the ICARDA programme leaders and were relocated permanently to the Aleppo site. These were Dr Jitendra P. Srivastava (Cereal Improvement), Dr Geoffrey Hawtin (Food Legume Improvement), Dr Bhal Somaroo (Forage Improvement) and Dr Shawki Barghouti (Training and Communications). Dr Brough headed the operations there, Dr Darling ran ICARDA from Beirut, and the third site for high-altitude research at Tabriz was soon to begin.

The First Years

Dr Donald Minehart, one of the first staff members appointed writes:

"In the autumn of 1975, Dr Omand Solandt and I spread out a map of the Tel Hadya area on the trunk of an ALAD vehicle and drew the outlines of our vision of ICARDA. At that time we were oblivious to the objections we would get from the three villages

involved, the limitations we had in people and funding, and the political problems extant in Syria. We were there to dream. To go back to ICARDA after 23 years is heartwarming. The dream is fulfilled!

I joined the staff of ICARDA in January 1977 and during the first two years, I planned and supervised the road, field, and plot layout. We erected a few structures at the farm center and imported a large quantity of surplus US military equipment. We enlarged the rock quarries for use as building sites and as a supply of crushed rock for our roads.

Encroachment by people and livestock was alleviated by the chain link fence around the farm. PVC pipe was imported to supply water to our plots containing valuable genetic material. We had to remain a dryland station.

It was essential to import the machinery that was adapted to both research plots and seed production and as funds became available we went to Europe as our primary source.

There were always problems in those early years but our staff members had an innate ability to resolve them. We who were here in 1977 and 1978 are proud that we gave this station a firm foundation, and believe that ICARDA is the crown jewel of the international agricultural research centers.

The proof of the success of ICARDA was apparent to me in a visit to Tel Hadya after 20 years. The employment opportunities and the use of the new technologies from ICARDA have brought prosperity to this village. That, too, fulfills the dream."

Land Acquisition in Aleppo

A few words on what has always remained a hot issue are in order. For any government to expropriate land from farmers is, from all points of view, a painful act. For that government to 'buy away' land from resource-poor farmers to give it to an 'American company' was especially so, and an act intensely charged with political and emotional overtones. The rumour mill got to work.

Ford's ALAD programme (an American venture) had come to Syria in the early 1970s and soon became the forerunner of ICARDA. Then, eminent personalities from North

America (e.g., Drs. Omand Solandt, Robert Havener, William Pelton, Owen L. Brough) came to Aleppo for shorter or longer tours, talking in seemingly covert language "on how about locating the new centre in Aleppo." Gossip spread in the city, first in whispers, and then gradually building to a loud and hostile outcry. The wildest version that filled the salons and streets of old Aleppo, when Tel Hadya became identified as the site, was that an American company had taken over the Tel Hadya zone.

Among the invaluable documents received for this book, the one provided by Mr Faik Bahhady (a former senior staff member of the Syrian Ministry of Agriculture who later joined ICARDA) is a priceless document now lodged in ICARDA's archives. This is the legal instrument (Law 22), dated 3 April 1977, which embodies the agreement signed with the IDRC of Canada.

Soon after the agreement was signed on 22 June 1977, the Syrian President Hafez Al-Assad issued a decree (427) on the basis of which the land in and around Tel Hadya was requisitioned. Faik Bahhady was by then actively involved on behalf of the authorities in the arduous and, indeed, painful process of taking land from farmers. He tells us that a key figure was Dr Ali Abed El-Ali. He was the single most influential person, who explained to the President the value of such a centre within the Syrian 'fabric' of agricultural research and training; and how beneficial it was bound to be, not only to Syrian agriculture, but to the region and indeed to the whole world.

Having just joined ICARDA as Assistant Director, Dr El-Ali, with his PhD in entomology from Berkeley, California, and his bubbling youthful dynamism, accomplished a superb feat. Tragedy soon followed when, only a few months later on 1 November 1977, Dr El-Ali was struck down by the bullets of an assassin on his doorstep in Aleppo. He gave his life at the age of 38 years in the cause of ICARDA.

The land that now constitutes Tel Hadya farm of ICARDA was assembled from four adjacent villages as detailed in Table 2.

As might be expected, the farmers' reaction in 1977 was

Table 2. Villages assimilated by the ICARDA site

Village Name/ (No.)	Privately Owned Land (m^2)	State Land (m^2)	Total (m^2)
Barkoum (No. 78)	2,189,214	32,185	2,221,399
Tel Hadya (No. 80)	4,972,730	48,865	5,021,595
Kessebia (No. 82)	2,078,727	46,650	2,125,377
Kamari (No. 85)	101,924	2,031	103,955
Grand Total	**934.2 ha**	**13.0 ha**	**947.2 ha**

sometimes bitter. So, how do they feel now, 25 years after the event? Ms Houda Nourallah of ICARDA volunteered to ask a sample of those farmers (or their next of kin) informally to gauge their feeling. She states that, in general, the mood is sombre; there is, even now, a longing to have their land back because the loss was immensely felt. A few are happy that, as a side effect, they (and their families) are gainfully employed by ICARDA, having an assured year-round revenue compared with the vagaries of income under rainfed farming. But the bottom line was spelt out in 1977 by H.E. Ahmed

Starting to surface yard at the Tel Hadya farm site, 1978.

Kabalan, then Minister of Agriculture and Agrarian Reform. He declared that in the overall interest of Syria the Government's decision was final and, based on the decree of the President, would prevail.

The End of the Tabriz Highlands Research Station

As the 1970s drew to a close, ICARDA confirmed its final set-up: a principal station (Tel Hadya) in Aleppo, Syria, and subsidiary twin stations in Lebanon (Terbol and Kfardan). The third principal location in Tabriz was closed during the Iranian revolution in 1978, forcing the evacuation of ICARDA from Tabriz. Dr Larry McFarlaine, the Assistant Director there, was transferred to Aleppo. Whatever vehicles and farm equipment could be rescued were driven overland westwards through Iraq to Syria.

ICARDA gets down to business*

The International Centre for Agricultural Research in the Dry Areas (ICARDA), having shaken off its troubled origins, is poised to embark on an ambitious research programme under the guiding hand of Dr Harry S. Darling, now president of Wye College, who is preparing to move to Beirut as ICARDA's director general.

The most recent of the international agricultural research centres, ICARDA will focus on improving food production in areas with an annual precipitation of 300-800 mm that is concentrated largely in the winter months. Its findings will affect a region extending from Morocco to Pakistan with crops covering some 70 million hectares in 20 countries.

ICARDA staff members like to say that the centre "was born running", because it absorbed some of the facilities and personnel of the Arid Lands Agricultural Development (ALAD) programme of the Ford Foundation. But it was soon faced with obstacles that brought it almost to a complete halt. After the decision to establish head offices in Beirut in spring 1974, war broke out, and most of the staff scattered to Cairo, Aleppo and Damascus. Negotiations

with Syria and Iran to obtain land for research stations were conducted chiefly by Canada's International Development Research Centre (IDRC) which had been appointed the executing agency for ICARDA; formal agreements were signed with Syria in June and with Iran in July last year. IDRC also reached an agreement with the Ford Foundation to ensure that ALAD activities relevant to ICARDA's mandate, notably the collection, testing and exchange of plant genetic materials, were continued.

On top of its research on the region's crops, ICARDA has been designated as the world international centre for barley, lentils, and broad beans. Barley, one the world's oldest crops, is particularly important in the region. But wheat is usually preferred because it has a higher gluten content and makes a more cohesive loaf of bread. Barley's two major advantages over wheat, however, should encourage its utilisation as human as well as animal food. One of these is that in regions with less than 500 mm of annual rainfall it can outperform wheat. Where rainfall is 375 mm or less, it is practically the only cultivable cereal. The other advantage, hinted at by current research, is that barley is susceptible to improvement, notably by an increase in content of lysine, an essential amino acid that is absent or exists only in minimal amounts in most food grains.

At present, barley yields in the Middle East are very low, and four ALAD-ICARDA barley varieties introduced in nurseries in 1976 indicate that performances can be considerably improved. Research is under way to deal with problems of disease susceptibility, lack of winter hardiness, intolerance to high temperatures, and insects. These trials will be undertaken in the ICARDA stations near Aleppo and Tabriz.

The food-legume crop improvement programme also continued in 1976. It consisted mainly in breeding and distributing germplasm of three major pulses: lentils, broad beans and chickpeas. The major emphasis is on the development of high-yield, stable varieties, and of lines suited to mechanised harvesting. There is a forage-crop improvement programme and some of the ALAD research work in wheat, maize and grain sorghum is being continued; so is the evaluation of several hundred lines of triticale, a man-made hybrid of wheat and rye.

Next year, ICARDA is expected to expand its activities. These will include the study of environmental systems throughout the region, the establishment of principles on which to base the development of appropriate farming strategies, and research into socioeconomic constraints that limit the actual

and potential production of existing farming systems. Finally, a training programme to help apply research findings is being set up.

From its inception until the end of last year, ICARDA's total budget barely exceeded $3 million. But now that 'running speed' is being resumed and total staffing has exceeded 50, more funds are required for operations and capital development. Interest in the programme is illustrated by the commitment for 1977 of a total of $4 million, the major contributors being the USA with $1 million, the IDRC/Canada with $600,000, Iran and Saudi Arabia with $500,000 each., and the World Bank and Australia with $220,000 each. Estimated expenditures of $4.85 million for 1978 and $7.77 million for 1979 have been submitted to the Board of Trustees, which is made up of representatives of some of the region's governments, agricultural research centres and donor agencies.

Alexander Dorozynski

* The first international publication on ICARDA. (Our thanks to Dr Euan Thomson, who brought this article to our attention.)
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4

Research

Research Mandate

ICARDA's Charter assigned it with the mandate to "promote improved and more productive agriculture in developing countries having a dry, subtropical or temperate climate through research and training activities, conducted primarily in the countries of the Near East, North Africa and the Mediterranean region, in order to raise the standard of living and promote social, economic and nutritional well-being of peoples of developing countries." Specific objectives included:

- to serve as an international centre for research into the improvement of barley (*Hordeum vulgare*), lentil (*Lens culinaris*) and faba bean (*Vicia faba*);
- to serve as a regional centre, in cooperation with other appropriate international agricultural research centres, for research in other crops of major importance to the region such as bread and durum wheat (*Triticum aestivum* and *Triticum durum*) and chickpea (*Cicer arietinum*);
- to conduct research into and develop, promote and demonstrate improved systems of cropping, farming and livestock husbandry;
- to collaborate with and foster cooperation and communication among other national, regional and international institutions in the adaptation, testing and demonstration of improved crops, farming and livestock systems; and

- to foster and support training in research and other activities carried out in the furtherance of its objectives.

Research Programmes and Facilities

To fulfil this mandate, the Centre initially organised its research into four research programmes:

- Cereal Improvement (CIP)
- Food Legume Improvement (FLIP)
- Pasture and Forage Improvement (PFIP)
- Farming Systems (FSP).

A Genetic Resources Unit (GRU); Training and Communication Unit (TCU); and a Station Operations Unit (SOU) supported these research programmes. The initial research staff for the first three programmes, and for GRU and TCU, came from the Arid Land Agricultural Development (ALAD) Programme. The FSP was initially operated through a team of consultants from the University of East Anglia in the UK, and later replaced by core staff. The name of the programme was later changed to Farm Resource Management Programme (FRMP). The PFIP group later expanded into the Pasture, Forage and Livestock Programme (PFLP).

Over the years, the programmes have been reorganised more than once. The present Germplasm Programme (GP) is the result of consolidating CIP and FLIP into a single programme in 1994. Likewise, PFLP and FRMP were combined in 1997 to create the Natural Resource Management Programme (NRMP). A GRU; a Seed Production Unit (SPU); a SOU; a Computing and Biometric Services Unit (CBSU); a Human Resource Development Unit (HRDU); and a Communication, Documentation and Information Services (CODIS) Unit now support research programmes.

Having started with minimal research facilities, comprising a single laboratory for crop physiology and cereal quality in the basement and an improvised greenhouse on the top of Office No. 1 building in Aleppo city, and a single Olivetti desk computer, the Centre has witnessed a fast and impressive expansion of its research facilities. There is now a range

of fully-equipped laboratories, with controlled growth facilities, for all major disciplines, a fully fledged computing centre, a battery of greenhouses and a fully automated library equipped with modern information technology. Expanded collaboration with NARS and National Agricultural Research Institutes (NARIs) in WANA to start with, and also in the CAC region later, and with the Advanced Research Institutes (ARIs) both regionwide and in industrialised countries, has provided access to other research facilities.

Staffing also grew steadily over the years, to a peak of 106 professional research and administrative staff, 49 associate scientists and administrative staff and 572 general support staff in 1987. Because of the financial constraints faced by the Centre in 1993, these numbers were reduced, and by 1997, stood at 87, 29, and 380, respectively. In 2001, the total number of internationally-recruited staff (professional research and administrative staff, and associate scientists and administrative staff) was 97 and that of the general services staff 328. The professional staff of the Centre have always worked in partnership with scientists and technicians in NARS, NARIs, and ARIs to produce international public goods for the benefit of dry area agriculture.

Research Overview

The broad annual rainfall range covered by ICARDA's mandate is from a little less than 200 mm to 600 mm. The major farming systems common in this rainfall regime are shown in Figure 1. The first 10 years of the Centre saw a major emphasis in research for environments with the annual rainfall ranging from 300 to 600 mm. In the following years ICARDA has placed increased emphasis on the drier spectrum of rainfed agriculture. These changes were in line with the strategic plans developed by the Centre in consultation with its stakeholders.

A broad mix of basic, strategic, applied and adaptive research has been carried out to meet ICARDA's multifaceted objectives. Basic and strategic research has mainly been done to enhance the understanding of the problems of

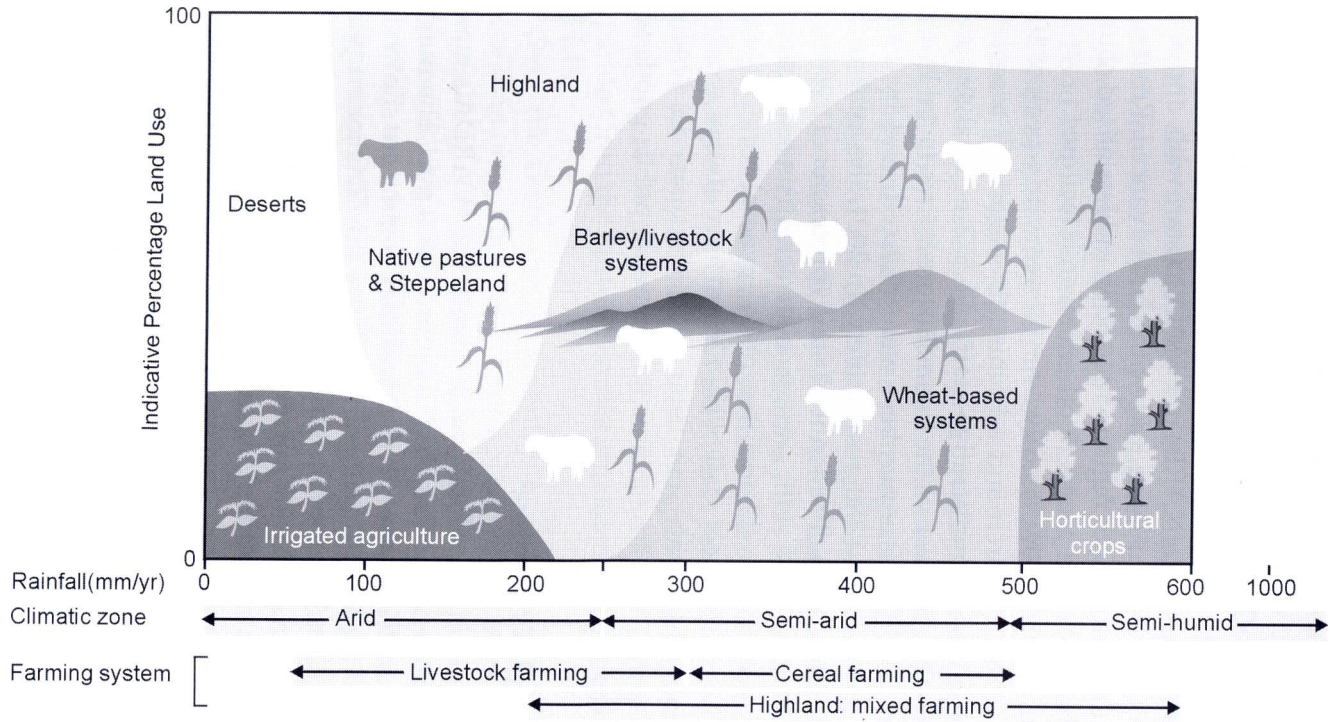
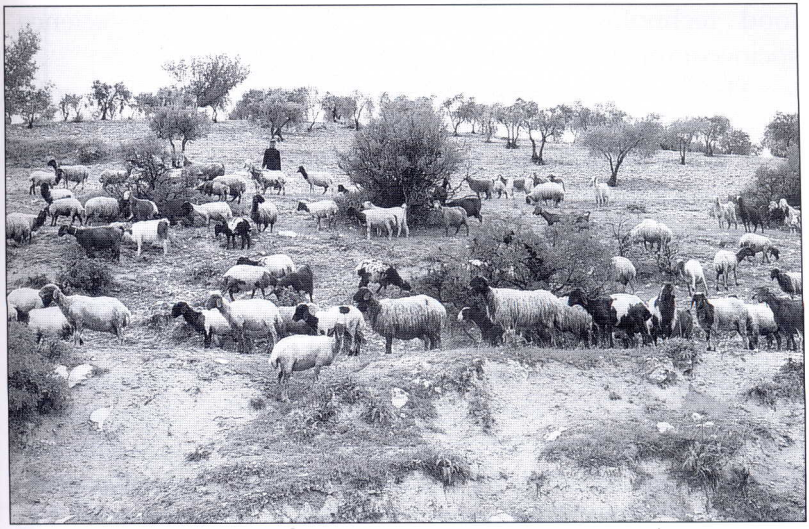


Fig. 1. The major farming systems in the ICARDA region.



Production systems in the dry areas are diverse but they all face the challenge of water scarcity and poor soils. Since livestock constitute a key component of the farming systems, ICARDA's strategy is to integrate crop and livestock in the production systems and optimize the use of soil and water resources for sustainable agriculture.

dry area agriculture and to develop appropriate techniques effective in increasing productivity in a sustainable manner. Other scientists from ARIs have participated actively in this work. The seven regional programmes, described in Chapter 7 (International Cooperation), have provided the framework for applied and adaptive research carried out mainly through partnerships with the scientists in NARS and NARIs.

Research results have been widely disseminated through publication of articles in peer-reviewed journals, proceedings of regional and international conferences, books, research reports, and through participation in workshops and conferences.

Germplasm Improvement

Germplasm improvement research on ICARDA's mandate crops has involved multi-disciplinary input covering genetic resources, genetics, plant breeding, molecular biology/ biotechnology, physiology, pathology, entomology, virology,

food technology, microbiology, agronomy, soil science, socioeconomics, anthropology and biometrics.

The initial emphasis was on developing 'finished' cultivars/varieties of crops for different agroecological conditions for evaluation by NARS partners under their agroclimatic conditions, and then for possible release to farmers. Associated with this was the enhancement of crop improvement skills of researchers and technicians within the NARS so they could share increased responsibility for development of new cultivars. A decade later, the Centre shifted its focus to producing more of early-generation breeding material and dispatching it to the NARS, through the International Nurseries and Trials Programmes, for further selection and development of cultivars adapted to their respective environments. The International Nurseries Programme has grown over the years, and currently some 2,500 sets of nurseries, including early-generation breeding material from targetted crosses and trait-specific genetic stocks from national programmes are dispatched to cooperators every year.

Up to December 2001, some 628 cultivars of ICARDA-mandated cereals, legumes and forage crops had been released in the countries of Asia, Africa and Latin America as well as in some industrialised countries (Table 1). These improved cultivars were developed in collaboration with

Both conventional (crossing by hand, as seen here) and new tools (biotechnology) are used at ICARDA in its crop improvement research.

Table 1. Number of varieties based on ICARDA germplasm released worldwide, 1977 to 2001

Region	Crop							
	Barley	Bread wheat	Durum wheat	Chickpea	Faba bean	Forage legumes	Lentil	Pea
- Developing Countries								
- Central Asia and Caucasus	20	30	5	14	1	1	8	-
- West Asia	25	76	32	23	19	5	20	5
- South Asia	16	8	1	2	0	1	8	-
- North Africa	37	31	38	23	6	5	13	2
- South America	15	-	-	-	-	-	3	-
- Other	12	1	-	1	4	-	9	1
Subtotal	**125**	**146**	**76**	**63**	**30**	**12**	**61**	**8**
- Developed Countries								
- North America	6	-	-	5	-	-	4	-
- Europe	17	8	21	24	1	2	2	1
- Australia	4	-	-	-	2	1	9	-
Subtotal	**27**	**8**	**21**	**29**	**3**	**3**	**15**	**1**
Total	**152**	**154**	**97**	**92**	**33**	**15**	**76**	**9**

NARS, with higher yields and resistance/tolerance to various abiotic (heat, cold, drought, nutrient toxicities) and biotic (diseases, pests) stress factors, and are widely grown in many different countries.

A selection from local landraces in Syria, 'Arta' has helped to increase barley yields in low rainfall areas of the country by up to 25%.

For example, in Syria, barley yields in low-rainfall areas have increased by 20-25% through the adoption of the new improved variety 'Arta.' During the severe droughts which occurred in Syria in 1999 and 2000, barley lines were identified that produced some grain and biomass even at about 100 mm annual rainfall. In Iraq, the improved variety 'Rihane 3' outyielded the local landrace by 67% in moderate-rainfall and by 28% in low-rainfall conditions. In Tunisia, China and Latin America, substantial yield increases have been obtained through adoption of new barley cultivars.

New cultivars and production technologies for lentils have benefitted Sudan, which has become self-sufficient in this crop. Also, Bangladesh, Ethiopia, Iraq, Jordan, Lebanon, Morocco, Nepal, Pakistan, Syria, Tunisia, Turkey and Yemen have benefitted. Harvesting of lentil was a major bottleneck in WANA, where the high labour cost of hand harvesting was making the crop economically unattractive to farmers. A system of mechanical harvesting was developed and promoted with farmers who now practise it on more than 100,000 ha in Turkey and Syria.

Research on faba bean has provided major benefits to

farmers in China, Ethiopia, Morocco, Sudan and Syria. Development of durable resistance to chocolate spot, rust and ascochyta blight, and broomrape parasite (*Orobanche* spp.), and of plant types adapted to different cropping systems, have been the major achievements. Much of this work has been done within the Nile Valley and Red Sea Regional Programme of ICARDA (see Chapter 7).

Research on winter sowing of chickpea, based on development of cultivars with combined resistance to ascochyta blight and tolerance to cold, has resulted in doubling of yield when compared with conventional spring sowing in WANA. The technique is increasingly being adopted in the region where the potential benefit in additional income is estimated at nearly US$ 1 billion.

Improving the nutritional quality by the genetic improvement of grasspea (*Lathyrus sativus*), an important drought-tolerant food legume that serves as an important part of the diet of the poor in Bangladesh, China, Ethiopia, India, Nepal and Pakistan, has been a major achievement. This has been done through the reduction in the content of a neurotoxin 3-(n-oxyl)-L-2,3 diaminopropionic acid (β-ODAP) in the grains, which causes paralysis of the legs. The low-neurotoxin lines are thus safe for human consumption. Research on feed legumes has resulted in the release of several cultivars of vetches and grasspea for different end uses – grazing, hay making, or producing grain and straw for stall-feeding. They are being used on a large scale, in rotation with barley, in low-rainfall marginal areas.

Research on durum wheat has resulted in cultivars able to withstand drought and heat but also responsive to improved moisture supply. They possess high grain quality necessary for producing various indigenous products such as bread, pasta, *couscous* and *freke*, made at the village level, as well as for industrially processed foods. The whole of WANA region has benefitted from this work, but particular impact has been witnessed in Syria where durum wheat yields tripled during the 1990s. Similarly, bread wheat varieties have been released for different agroecological conditions. New varieties with increased heat tolerance have permitted

expansion of wheat cultivation south of Khartoum in Sudan. Yield increases in Egypt, Syria and Tunisia from the new improved bread wheat cultivars with improved disease resistance have been substantial. The impact of improved varieties of wheat and of production technology on both the production of wheat and the land area saved in Syria is shown in Figure 2.

The Germplasm Programme has developed a particularly efficient approach to germplasm enhancement for stress-prone environments. Improved screening techniques for drought, heat, cold and common diseases and pests are used, along with decentralised breeding entailing the provision of varieties with specific adaptation to local environments. This requires the use of a range of genotypes, which permits retention of increased genetic diversity in the field, and thus reduces the risk from diseases, pests and uncertain weather conditions. This approach, which is gaining international recognition, is better suited for harsh environments than is the contrasting approach of developing a broad adaptation targetted for more uniform and less stressful environments.

The Programme has contributed to a global reassessment of the value of locally adapted germplasm (landraces) and of wild relatives in crops such as barley, lentil, durum wheat, chickpea and forage legumes. Sources of resistance to common diseases and pests, and abiotic stresses, in such wild rel-

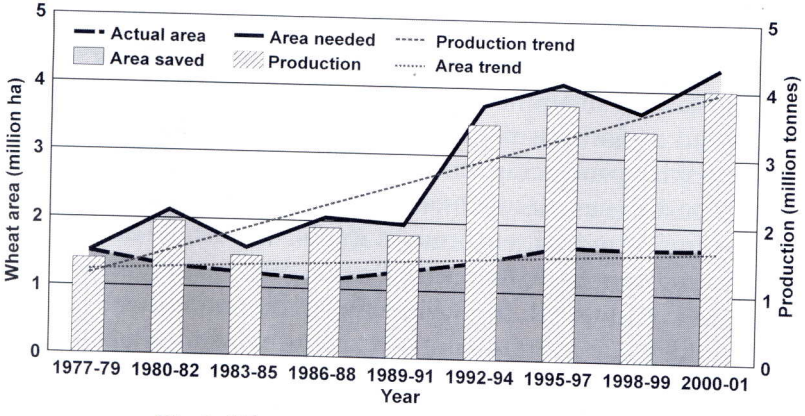


Fig. 2. Wheat production in Syria, 1977-2001.

atives as *Triticum boeoticum*, *T. dicoccoides*, several species of *Aegilops* and *Hordeum spontaneum*, have been used. *H. spontaneum* has significantly contributed to enhanced drought tolerance in barley. *Cicer reticulatum* has proved a good source of cyst-nematode resistance, cold tolerance and high biomass yield in chickpeas.

The Programme has demonstrated the importance of participatory approaches in germplasm development by involving farmers—both men and women—in making selections from segregating populations on their own fields, and disseminating new varieties. This participatory approach was first tested in Syria and is now being used in six other countries: Egypt, Eritrea, Morocco, Tunisia, Sudan and Yemen.

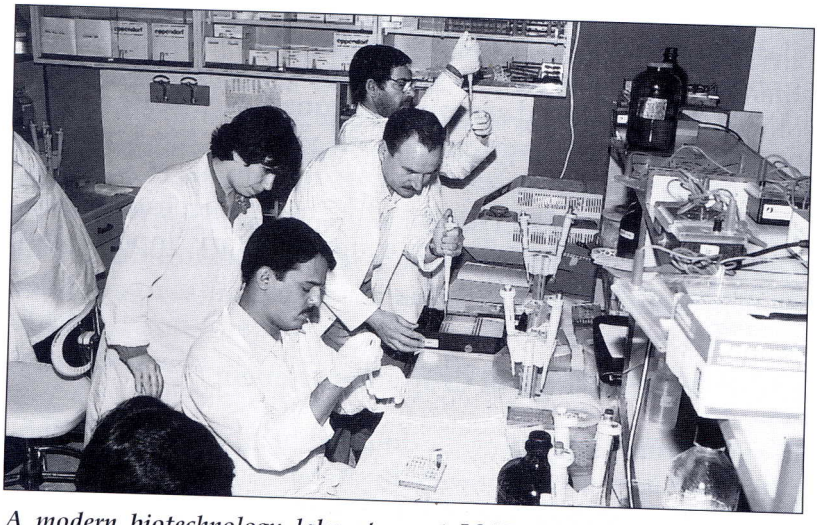
National breeding programmes have been considerably strengthened in their ability to undertake applied and adaptive research, assisted by training and other support in either bilateral or multilateral modes. The Germplasm Programme supports national breeding programmes by providing nearly 100,000 to 150,000 seed samples on request each year. A large number of trainees participate each year in crop improvement training activities through the Programme. In addition, several crop improvement networks have been established, which permit enhanced and complementary inputs, and encourage local leadership.

Use of Biotechnology in Crop Improvement

Tissue culture techniques for doubled-haploid (DH) production came into use for barley improvement during 1987-89 when interspecific crosses with *Hordeum bulbosum* were used to produce doubled-haploid lines. The anther culture system for DH production was introduced in wheat during 1989-91. Lines using interspecific crossing have been tested and field evaluated, especially in hot spots for Hessian fly in the Moroccan National Programme. Promising spring bread wheat lines combining Hessian fly resistance with good agronomic performance have been released in Morocco. Doubled-haploid lines of winter and spring bread wheat have also been produced since 1994, with the objective to

incorporate yellow rust resistance into adapted cultivars, since breeding lines of wheat have shown a breakdown of the yellow rust resistance genes currently used in the region. Breeders and pathologists evaluate around 1,000 lines of winter and spring bread wheat at the Tel Hadya research station of ICARDA every year for yield performance and reaction to yellow rust.

With the help of a UNDP/French Government-funded project (1990-1996), molecular biology and tissue culture laboratories were established at ICARDA. In the molecular biology laboratory, greatest emphasis has been given to using DNA molecular marker techniques for ICARDA's mandate crops. Projects for genome mapping and gene tagging have been developed for barley, lentils, chickpea and durum wheat with additional special project funding from BMZ.



A modern biotechnology laboratory at ICARDA is used both for the Centre's germplasm enhancement research and to provide training to researchers from the region and beyond.

In barley, an integrated linkage map was constructed, consisting of 160 marker loci, for crosses made for combining resistance to powdery mildew and scald. Qualitative trait loci (QTLs) were identified for target diseases and yield under drought-stress conditions. Molecular markers have been identified for brittle rachis and plant height under drought in a cross with a wild barley.

In lentil, molecular markers for fusarium wilt, radiation frost tolerance and winter-hardiness were developed and QTLs identified.

In chickpea, Sequence-Tagged Microstellite Site (STMS) molecular markers were developed for gene tagging in the plants as well as the ascochyta blight causing fungus. This allows gene pyramiding for resistance to ascochyta blight in chickpea.

In durum, specific molecular markers are being routinely used for selection for good technological quality. A linkage map for durum wheat was developed using Restricted Fragment Length Polymorphism (RFLP), Random Amplified Polymorphism DNA (RAPD), STMS and Amplified Fragment Length Polymorphism (AFLP) markers. These markers have also been used for the characterisation of gene bank material.

Lately, development of a transformation and regeneration system for chickpea and lentil has made good progress in collaboration with several ARIs. Following the approval of biosafety regulations in Syria, the Centre's laboratory now has started this work within its own contained environment facility.

A programme to train the region's scientists in using biotechnology tools has been established. As well as an annual training course on molecular marker techniques for senior scientists and administrators, this programme accepts individual trainees. Many men and women have been trained in specific DNA marker applications as well as tissue culture techniques within ongoing research projects.

Pasture, Forage and Livestock Production Improvement

Early work of the Pasture and Forage Improvement Programme mainly focussed on identification and evaluation of forage species including annual legumes such as vetches (*Vicia* spp.), pea (*Pisum sativum*), medics (*Medicago* spp.), perennial legumes and grasses. The work included collection of forage germplasm, identification of annual forage and pasture species to replace fallow and rehabilitation of marginal lands. The Centre's first five-year external review recom-

mended linking the work on pastures and forages more closely to grazing animal production. As a result, ICARDA's livestock work was transferred from the Farming Systems Programme into what came to be known in 1984 as the Pasture, Forage and Livestock Programme.

Work on marginal land improvement was necessary because such land is usually over-grazed by sheep and goats; and hence frequently suffers from soil erosion. The research aim was to increase and stabilise livestock productivity by controlling erosion and by improving pastures through optimal grazing management systems. More than 20 experiments, some of them long-term, were carried out on marginal lands. The results showed that annual application of 25 kg/ha P_2O_5 alleviated the phosphorus deficiency and improved pasture production even in dry years. Legume production and legume seed mass increased three-fold and total seed number six-fold, and efficiency of rainfall-use doubled. Liveweight and milk production increased in the case of sheep grazing pasture treated with phosphate. The need for supplementary feeding was reduced. It was also demonstrated on farmers' fields that the degradation of communally-owned land could be reversed by phosphorus application, conservation and use of native legume populations, and by deferring grazing at critical (flowering and seeding) stages of pasture growth.

There are extensive rangelands in WANA on which work was started in 1989 in collaboration with the Steppe Directorate of the Ministry of Agriculture and Agrarian Reform in Syria. This involved the introduction of saltbush species to rehabilitate rangeland. The native species *Atriplex halimus* and *Salsola vermiculata* performed better than exotic species (*A. nummularia* and *A. canescens*). They could be established by direct seeding and had good self-regeneration. These experiments have been conducted for eight seasons to assess productivity of saltbushes under different stocking pressures. Bedouin families in the Syrian steppes are adopting the saltbush system.

Research on introduction of saltbush on rangelands was also conducted in Quetta, Pakistan, as part of a USAID-

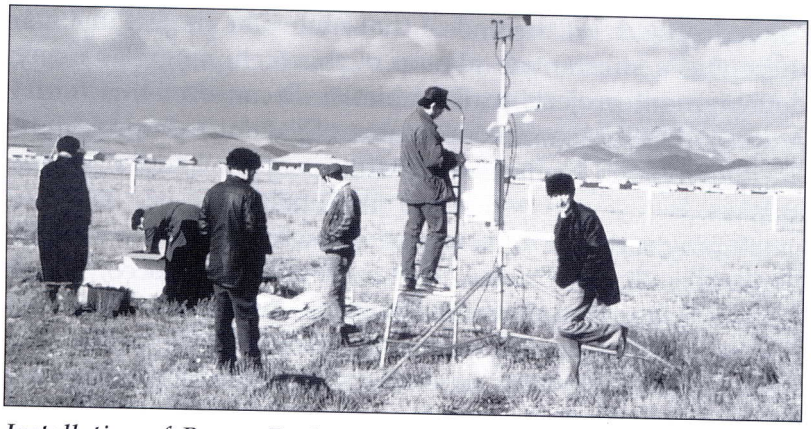
funded project. At the end of that nine-year project in 1994, there was a substantial take-up of this technology by many development projects in Balochistan. Because of this initial success, ICARDA now coordinates a System-wide project on 'Production and Utilization of Multi-purpose Fodder Shrubs in West Asia, North Africa and the Sahel.'

A rangeland germplasm collection from diverse sources (Australia, Egypt, France, Jordan, Mexico, Morocco, Saudi Arabia, Spain, Sudan, Syria, Tunisia, Turkey, USA and the Central Asian countries) was established in 1998, including a wide range of taxa from desert habitats. Native range species are being successfully used for range rehabilitation in Egypt and Syria (*Artemisia herba-alba* and *Salsola vermiculata*) and Central Asia (*Haloxylon* spp.). In Central Asia, new crops to overcome feed shortage in winter have been identified. These include *Agropyron desertorum, Avena sativa, Bromus inermis, Dactylis glomera, Festuca arundinacea, Lolium multiflorum, Medicagi sativa, Onobrychis sativus* and *Sorghum sudanense.* Also, the potential use of mulberry as forage in Uzbekistan is being investigated.

A carbon-flux research project is being implemented in Uzbekistan, Kazakstan and Turkmenistan to understand the role of rangelands as a carbon sink in Central Asia.

ICARDA livestock research has concentrated on small ruminants—sheep and goats. Farmers have responded to increased demand for livestock products by increasing the numbers of small ruminants. This is adding to overgrazing pressure on natural pastures. The challenge is to make these animals more efficient converters of the feed produced under local conditions. The research has emphasised integrated feeding systems that use a combination of natural pastures, large amounts of cereal straw and stubble, and agro-industrial by-products, wherever possible, with supplementary energy- and protein-rich feed at critical times in the reproductive cycle.

Perhaps the Programme's most notable achievement has been with forage legumes. In conjunction with local communities, on-farm evaluation in the mid-1990s in the El-Bab district of Syria showed that vetches and chicklings could be



Installation of Bowen Ratio Equipment at a site near Samarkand in Uzbekistan for carbon-dioxide flux monitoring.

used as forage for fattening lambs. Extra liveweight gain is from 150-180 kg per hectare. It was also observed that replacing barley monoculture with barley-vetch rotations improves barley productivity by reducing disease build-up and by enhancing soil fertility.

About one-third of the feeding value of barley comes from its straw, which is an important part of the winter diet of small ruminants. ICARDA has found considerable genotypic differences in the nutritional quality of cereal straw, and has established that good straw quality can be combined with good seed yield. The use of near-infrared reflectance spectroscopy gives a good prediction of feeding value, and permits evaluation of large numbers of samples without the need for time-consuming and expensive feeding trials.

The major challenge over the past years has been to achieve a widespread adoption of new systems of small-ruminant, forage and pasture production and management. The traditional belief of farmers that animal feed is a free resource, whether range grazing regulated only by tribal boundaries or cereal stubbles in the arable areas, has been a barrier to the adoption of new feeding systems. Scarcity of seed adds to the problem. Despite difficulties, farmers are beginning to see the benefit of introducing or reintroducing forage crops into their cropping systems, to replace fallow. Also, the practice of continuous cereal cultivation is abandoned.

The potential of technologies to enhance flock productivity has been demonstrated in Iraq, Jordan, and Syria as part of a regional project—the Mashreq and Maghreb Project. Such technologies include vetch for grazing, early weaning to spare more milk for sale, multi-nutrient feed blocks made from agro-industrial and crop by-products, use of spineless cactus as feed, vitamin A, D and E injections to enhance fertility, synchronisation of oestrus to narrow the lambing season and super-ovulation to boost lambing rate. Adoption of these technologies has been variable, but the impact is evident where they have been taken up.

Work on animal health has concentrated on the control of internal parasites, particularly lung worms for which standard medication protocols have been recommended. Good success has been made in controlling Brucellosis.

To enhance the income of the livestock producers, research is underway on developing small-scale processing techniques for dairy products so that farmers could benefit from added value to their milk production.

Natural Resources Management

At first, the Farming Systems Programme was concerned primarily with production-system description and improvement. Over the years it has expanded to include the study and promotion of efficient and sustainable utilisation of the natural resource base of land, soil and water for agriculture. Research encompasses a continuous spectrum of multi-disciplinary activities across environments and commodities, ranging from agroclimatology, through land and water resources and their management, to agronomy and technical and socio-economic dimensions of farm-level production systems and their natural resource base.

Among the Programme's major achievements have been a number of additions to the knowledge base in WANA, including:

i. a description of dryland crop and crop-animal production systems and their evaluation over time, and the identification in those systems of farmer perceptions of crop characteristics and input use;

ii. a computer model for generating weather data on a spatial basis, with linkage to crop growth models;
iii. quantification of the contribution of fertiliser to water-use efficiency and crop production, of supplemental irrigation for the efficient use of rainfall and small irrigation sources, and of forage and food legumes to system nitrogen and biomass production; and
iv. an improved understanding of water and nutrient dynamics within rotational cropping systems under different management and input regimes.

At the farm level in WANA, successes have included:

i. introducing fertiliser into dry-area barley production in Mashreq countries;
ii. more efficient use of water in the supplementary irrigation of winter crops; and
iii. introduction and development of more acceptable crop production technologies such as advancement of date of sowing, use of legumes in cereal-based cropping systems, and use of seed drills.

However, it is through the development of new research approaches that the Farm Resource Management Programme (now Natural Resource Management Programme) has made its most significant contribution. The application of the 'farming systems approach' entails development and application of appraisal and survey methodologies—usually with NARS partners—which describe specific farming systems or monitor the adoption of technology. The next stage is a problem-solving research sequence through farm-level problem diagnosis, research station experimentation with systems, solution identification and farm-level testing, to demonstration and extension. The cycle is completed by adoption studies and diagnosis of any new problems arising.

Agriculture is a continuous activity and must be sustainable. Some initially profitable practices have often proved unsustainable in the long term. Therefore, long-term trials, established more than 15 years ago to provide a direct comparison of productivity between different rotational sequences of crops and land management inputs, were also used to gain information on sustainability in the form of

trends in crop yields and soil physical and chemical properties. Information on soil carbon changes and carbon sequestration has been of interest in relation to the impact on global climate change.

Pre-existing production systems are a function of their local environments. Methodologies are needed to describe those environments, to understand the limitations and potential they have for production systems, and to facilitate the design of new crops, genotypes and other technologies to fit those systems. An agroecological characterisation project addresses these issues. A set of statistical tools (spatial weather model and crop growth models) has been developed, adapted and tested to characterise production environments in terms of specific crop and genotype yield probability. Establishment of a Geographical Information System (GIS) laboratory and access to remote-sensing technology has greatly accelerated the pace of this work.

Essential to all agricultural production is the land and water resource base. Initial soil research was concerned mainly with fertility, and successes included the quantification of the contribution of legumes to the soil nitrogen balance and promotion of judicious fertiliser use in dry rainfed systems. Fertiliser application enhances the efficiency of rainfall utilisation, and further enhancement can be achieved by the use of supplemental irrigation where possible. This technique has been developed as a 'deficit irrigation' strategy by combining the use of rain and irrigation water to optimise the water-use efficiency and to increase and stabilise the yield levels of essentially rainfed crops.

Water harvesting techniques are now being used to permit supplemental irrigation in low-rainfall areas away from the major irrigation schemes. New research is also being carried out on optimising and sustaining the use of groundwater. Remote sensing is being employed for identifying suitable sites for water harvesting. An 'ecoregional project' was launched to support national research activities in eight countries. This included an appraisal of both indigenous practices and new techniques of harvesting and using water.

An important activity was the 'dryland resource manage-

ment project,' to help small national research teams undertake multi-disciplinary studies of local problems of natural resource management, while focussing on the interface between the technical and socio-economic factors that drive resource users into non-sustainable practices. Achievements included the promotion of studies in Lebanon and Yemen into fully-funded bilateral projects and, in several other countries, the building of research links between individuals from different organisations.

Following the establishment of the Natural Resource Management Program (NRMP) in July 1997, ICARDA has identified the development goal of its integrated natural resource management (INRM) research as sustainable production systems in harmony with the totality of the environment—meteorological, biophysical, economic and socio-political, that fulfill social and economic needs of the population of the dry areas. Within this goal, the research products of ICARDA's INRM include:

- *System components*: Production and resource management technologies and resource management practices that promote greater efficiency, integration and sustainability of production;
- *System management*: Systems management options, applicable within identified agroecologies, that provide solutions to resource degradation problems; and
- *Strategic products*: Methodologies, comparative and policy studies, decision-support systems and human resource capacity building in natural resource management.

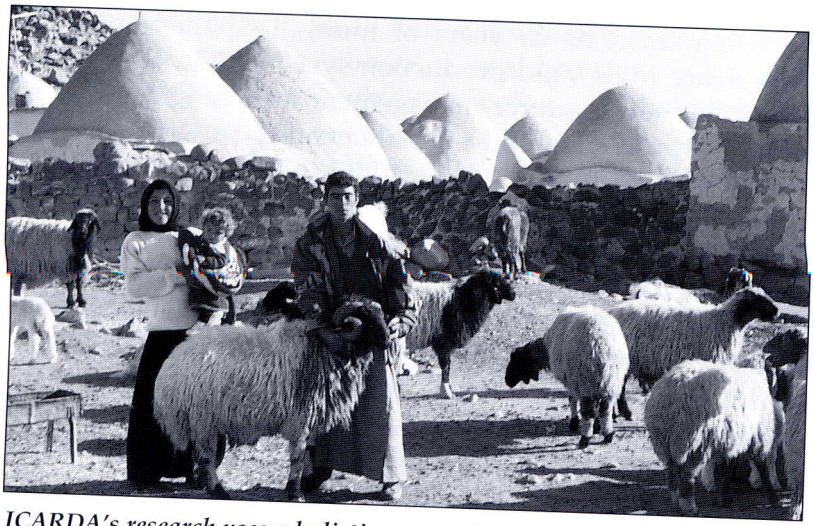
There is a clear recognition in the Programme that the natural resources of water, soil and vegetation, essential for the present and future agricultural productivity in the dry areas, are facing unprecedented threat of degradation. The degradation is a product of recent evolution in agricultural systems, and fundamental solutions to the problem of sustainable resource use must be found at the system level. ICARDA's strategy in addressing the problems of conserving and sustaining natural resources is firmly rooted in the context of rapidly evolving agricultural systems in the dry areas.

Drawing upon its 25 years of multi-disciplinary research experience in dryland production systems, ICARDA recognises that new resource-management technologies must be multi-purpose. They must simultaneously provide resource users with increased productivity while improving the health and productive potential of the natural resource base.

In evaluating technologies designed to improve resource sustainability, ICARDA employs indicators to measure performance and impact in terms of outputs and income per unit of resource used (total natural resource productivity); resource conservation and improvement (environmental stress and well-being indices); and reduced use of external, particularly chemical and fossil fuel, inputs. ICARDA seeks to develop partnerships with communities and groups of resource-users that better correspond to the nature and domain of the resource under threat than the conventional focus on a single producer or individual farmer decision-maker. ICARDA works with communities and groups to create a range of management options amenable to simple decision-support systems that can be used beneficially by the communities themselves, without creating reliance or dependence upon outside agents or agencies. In this way, ICARDA fosters empowerment of local resource users as a means to enable them to deepen and expand sustainable natural resource management.

ICARDA has developed its INRM research through a process that follows four stages: (1) problem identification, prioritisation and characterisation; (2) system identification, prioritisation and characterisation; (3) site identification, prioritisation and characterisation; and (4) implementation and assessment. Problem identification stems from the recognition, based upon ICARDA's depth of experience in the dry areas, that the essential problems in sustainable agriculture revolve around issues of resource degradation, especially water, soil and biodiversity.

During 1996-97, ICARDA scientists conducted a prioritisation of natural resource management issues that the Center has an objective comparative advantage in addressing. Problem prioritisation included the views and concerns of



ICARDA's research uses a holistic approach that takes into account the limitations of resources faced by rural communities and the livelihood strategies they adopt within those limitations.

existing and potential NARS and ARI partners and other stakeholders. Water-use efficiency and quality were accorded the highest priority. Soil fertility and conservation, as well as the sustainable use of natural vegetation and biodiversity, are closely linked to water management, and all these resources are subject to climate in the dry areas. Accordingly, the current Medium-Term Plan contains core projects addressing these subject areas.

Combining biophysical resource and agroecological with socio-economic considerations, ICARDA has identified the following as priority research domains for INRM research in the dry areas: (1) mixed crop, range, and small ruminant systems; (2) rainfed cropping systems; (3) conjunctive water-use cropping systems (rainfall and irrigation); (4) fully-irrigated cropping systems and (5) peri-urban agricultural systems.

Following selection and prioritisation of research domains, the third stage is identification, prioritisation and characterisation of field research sites. Recognising the site-specific nature of much of its natural resource management research, ICARDA has developed the concept and method of the 'integrated research sites' to ensure replicability of success and scaling-up of results and recommendations.

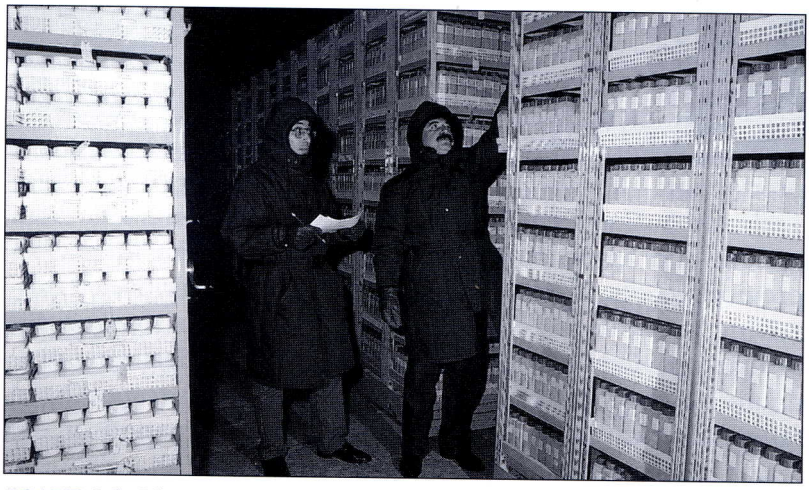
Each site represents a combination of critical NRM problems and important agroecologies in the CWANA region. The Khanasser Valley site in Syria represents a combination of rainfed and supplemental-irrigation cropping with small-ruminant production. Resource management problems include depleted groundwater supplies, declining water quality, serious soil erosion on overgrazed sloping land and low soil fertility. People are poor and out-migration for seasonal wage labour employment is common. The site in Egypt is, in fact, five sites, each representing a different combination of resource management problems and production systems. Four of the five sites are characterised by full irrigation with high cropping intensities. The fifth is a low-rainfall site where soil moisture management is crucial for sustaining production. A newly selected site is in Boykozon, near Tashkent in Uzbekistan. Boykozon represents a management system and agroecology undergoing rapid transition. The previous centralised management system deteriorated following the collapse of the Soviet Union, and subsequently serious problems of resource degradation and declining productivity have developed while producers' incomes have fallen drastically. The site represents a combination of the major agroecological systems in Central Asia: full irrigation, rainfed farming, and transhumant pastoralism.

Genetic Resources

To meet the needs of crop improvement programmes at ICARDA and in NARS, the Centre assembled comprehensive *ex-situ* germplasm collections of its mandated cereal and legume crops relevant to improving the farming systems in CWANA, as well as pasture and rangeland species for restoring or rehabilitating degraded rangelands. ICARDA's gene bank holds the largest germplasm collections in the southern Mediterranean region, with more than 127,000 accessions. The Centre's germplasm holdings account for 20% of the CGIAR total. With high priority given to indigenous germplasm from CWANA, the region of both origin and diversity of ICARDA's mandate crops, collections are essen-

tial for meeting the future needs of sustainable agriculture in the region and elsewhere.

When the Genetic Resources Unit (GRU) was established at ICARDA in 1983, the germplasm collections comprised 53,000 accessions. A vigorous collecting program in cooperation with NARS yielded 25,000 unique samples collected in 155 missions. In addition, GRU has acquired a further 49,000 accessions through germplasm exchange with many other gene banks.



ICARDA holds over 127,000 accessions of its mandate crops in its gene bank, the largest in the southern Mediterranean region.

As well as seeds, ICARDA maintains a sizeable collection of 1,564 rhizobial accessions. The strains of *Rhizobium ciceri* (99), *R. legominosarum* (495), *R. meliloti* (738) and *R. trifolii* (232) were collected or acquired from 28 countries, predominantly from the WANA region.

In 1989, new gene bank facilities, meeting high international standards for both medium-term and long-term seed preservation, became operational. This was a prerequisite for joining the FAO Global System in 1994, when ICARDA's germplasm collections were placed under the auspices of the FAO to be held in trust for the benefit of the global community.

The germplasm collections have been systematically char-

acterised for a number of descriptors using agro-morphological evaluation, biochemical and, recently DNA-marker technology. Large collections require an efficient documentation system to facilitate the conservation, characterisation, distribution and use of material. Since 1992, a computerised database has been available to ICARDA staff on the Centre-wide computer network.

Dissemination of information about the content and characteristics of germplasm is vital for users to select the most appropriate material. GRU has published catalogues of barley, durum wheat, faba bean, lentil, chickpea and wild *Cicer* germplasm.

Additionally, GRU provides the listings and/or the data on diskettes in response to direct inquiries from users. Since 1996, ICARDA has been participating in the System-wide Information Network for Genetic Resources (SINGER), which makes information on CGIAR-maintained germplasm available on the Internet.

GRU also maintains international databases for wheat wild relatives and Mediterranean forages, developed through collaborative projects with IPGRI. The system for the *Aegilops* and wild *Triticum* spp. covers over 16,000 accessions from 52 gene banks while the database dedicated to the Mediterranean forage legume germplasm registers over 37,000 accessions of 750 taxa conserved in over 90 collections.

There has been an increasing demand from breeders and plant scientists for the germplasm held in the ICARDA's gene bank. The Center distributes about 25,000 seed samples to users in its own research programmes and to NARS of developing countries and elsewhere every year.

Faba bean, one of ICARDA's global mandate crops, is partially cross-pollinated by insects. Consequently, over 5,100 pure lines of faba bean (faba bean pure line, BPL) have been derived from the usually heterogeneous and heterozygous international legume faba bean (ILB) accessions. These were developed through a 'pre-breeding' process in which randomly selected single plants were taken to progeny rows in a cyclic manner, using insect-proof screenhouses to ensure selfing.

The breeding programmes of faba bean, lentil, kabuli chickpea and, more recently, forages are built upon the foundation of the germplasm collections. To date, 56 cultivars of temperate legumes have been released after development from landraces or ecotypes from the germplasm collections. Many of these are selections that have been purified for such traits as seed size, disease resistance, frost tolerance or non-shattering pods.

To promote community-based *in situ* conservation of crop wild relatives and landraces in their centres of origin, ICARDA has developed with its NARS partners and IPGRI and ACSAD a major project entitled 'Conservation and Sustainable Use of Dryland Agrobiodiversity in Jordan, Lebanon, Syria and the Palestinian Authority.' This is a US$8.1 million project funded by the Global Environment Facility (GEF) through the UNDP. Sixteen target crops, or crop groups of global significance, together with their wild relatives, are included. These range from wheat and barley to clovers and olives to pistachios and figs. Implementation of the project on two sites in each participating country is by NARS, while ICARDA is responsible for coordinating and executing the regional component.

Seed Health Testing

In 1982, ICARDA established the Seed Health Laboratory (SHL) within the GRU to secure safe movement of seed to and from the Centre. These facilities were upgraded and expanded in 1989 to meet the increasing demand for seed exchange. While quarantine is the responsibility of host-country governments, ICARDA takes its own post-quarantine measures to ensure the health of both incoming and outgoing seed. These measures include: visual inspection, fumigation, seed health testing, seed treatment and field inspection. The SHL collaborates with research programmes in selecting fungicides for seed treatment against seed-borne pathogens. The laboratory has also developed improved diagnostic techniques for detecting *Pyrenophora graminea* in barley seeds and *Pseudomonas syringae* pv. *pisi* in pea.

Virology

The Virology Laboratory at ICARDA was established in 1985 as a special project with support from the Netherlands government, but became fully core-funded from 1989. The Institute of Plant Protection (IPO) in Wageningen provided technical backstopping for the project until 1991, again with financial support from the Netherlands Government.

Intensive surveys to identify virus diseases affecting cereal and legume crops in the WANA countries have been conducted by ICARDA in collaboration with NARS scientists. A lack of reliable diagnostic kits hampered virus surveys by NARS; so intensive efforts resulted in Enzyme-linked Immunosorbent Assay (ELISA) kits for the detection of 13 viruses affecting legumes, and three cereal viruses. Those kits have been made available free of charge to all virology laboratories in the region for monitoring the virus spread in crops and for testing for seed-borne viruses.

Working closely with plant breeders, sources of resistance to economically important viruses were identified. Barley and wheat genotypes resistant to barley yellow dwarf virus, faba bean genotypes resistant to bean yellow mosaic virus, and lentil genotypes resistant to three different viruses were identified. Virus resistance was also evaluated in a large collection of crop wild relatives.

Monitoring seed-borne viruses in seed shipments coming to ICARDA as well as those distributed by ICARDA has been one of the major responsibilities of the virology laboratory. It is also responsible for cleaning all germplasm collections in the ICARDA gene bank of seed-borne viruses.

Seed Unit

In 1985, ICARDA made an innovate move into seed technology with the appointment of a Seed Production Specialist, with special project funding from the governments of Germany and the Netherlands. This reflected a recognition of the importance of seeds as the delivery mechanism for all improved genetic material developed by the Centre and its NARS partners. As more staff and facilities were added, it

became identified as the 'Seed Production Unit' of the Centre, and later as the 'Seed Unit'.

From the outset the Unit had two main activities. One, to support the plant breeding programmes at ICARDA by undertaking specialist services relating to varieties and seeds such as variety purification, description, maintenance and the production of early-generation seed lots. This relieved the breeders of some technical work and strengthened the links with users of these seeds within NARS. The other activity was to strengthen seed programmes within the countries of the region so as to support their role in the delivery of improved seeds to farmers. This task was pursued mostly through an extensive programme of training courses both at headquarters and in countries of the region. The Unit gradually developed a range of facilities at Tel Hadya including a small seed processing plant, a seed testing laboratory and a seed store, which were managed as a common service on behalf of the breeding programmes. In addition, these facilities were an invaluable resource for training courses held at the Centre.

In 1992, the regional activities of the Unit were consolidated by the establishment of the 'WANA Seed Network' at a meeting held in Amman. This initiative was intended to facilitate the exchange of information between the countries of the region, which had very diverse experience in the seed sector development. An administrative structure was set up and the participating countries were allocated responsibility for a large number of activities. The Seed Unit provided the coordinating Secretariat for the Network, and particularly for the preparation and production of its many publications. These included a newsletter *SeedInfo*, published twice a year, and a range of technical materials including catalogues on various subjects related to seeds in the region. The Network continues to provide the main regional window for the Seed Unit.

The joint funding from the original donors ended in 1995. However, the Netherlands Government then provided funds for a substantial training project which ran for 5 years, while Germany continued to support the expanding interest of

ICARDA in the economics and policy aspects of national seed programmes, which in many countries hold the key to development. In fact, since 1996 these aspects have become a major theme in the work of the Unit, to some extent replacing the earlier emphasis on the technology of seed production. This shift is entirely appropriate, given the rapid changes taking place in the global economy and in the seed industry also. It is clear that NARS and national seed organisations now have to deal with a more diverse and rapidly changing seed sector and they must come to terms with that if they are to achieve rapid diffusion of their products, and the 'impact' of research investment.

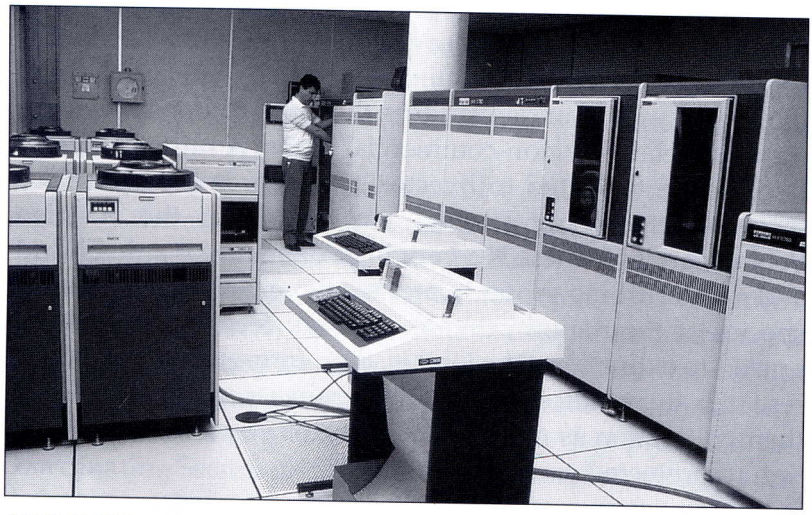
Another notable shift in the work of the Unit in recent years has been the extension from field crops into forages. Despite much research on forage crop systems, it is still difficult to establish a truly sustainable seed supply system because the seed systems are handled almost entirely by the informal seed sector at community level. This emphasizes the importance of understanding the way local systems work on these relatively non-commercial crops. A rather different development, related to livestock feeding, is the search for more water-efficient species, particularly in the Arabian Peninsula where there is a very high demand for animal feed and a diminishing groundwater resource. Some of the native species of the region provide excellent feed but have been grazed to extinction. The Unit is, therefore, engaged in active research to produce seed of these species, and to facilitate their cultivation as managed forages, or possible reintroduction to protected grazing areas.

Computing and Biometrics

Computers

The Computing and Biometric Services Unit (CBSU) was set up in 1980. Its major achievement has been to transform the analysis and management of ICARDA's research and management data into a manageable process. The first computer ICARDA purchased was a PDP11/34 in 1978, replaced by two vast and complex VAX 11/780 computers, costing some

US$500,000. To install this huge outfit required a concrete-floor room, and an adjacent room to house its ancillary software and other facilities. Several engineers and technicians regularly came over from Britain to supervise its installation and commissioning. To start with it was hooked up with some 40 users by cables stretching out hundreds of metres in some cases. It was like a prize bull; people came from near and afar to see this rare species! For several years, this impressive oufit sat supreme and unchallenged. However, by the early 1980s personal computers appeared; the threat became imminent! By 1985 they made serious inroads in the dominion of our prized machines; and by 1992 the two VAX 11/788 machines became virtually redundant as the PCs proliferated. ICARDA gave its VAX machines, as a present, to the University of Aleppo.



VAX 11/780 computers that marked the beginning of the introduction of computing technology at ICARDA.

The use of computerised applications in virtually all of ICARDA's activities has contributed significantly to increased staff efficiency. All senior researchers, and their associates and assistants have personal computers with access to many software packages, either loaded on the PC or on the local area network. Milestones in the development of the computing environment were the establishment of the

local area network in 1992, the external e-mail service in 1996, and the connection to the Internet in 1999. More than 380 PCs are now connected to the network as well as to a variety of computer peripherals. An Intranet is also operational providing a valuable vehicle for information sharing.

Several scientific applications have been developed over the years. In the first decade of its operation with the VAX 11/780, these included CRISP for the statistical analysis of experimental data and CERINT for the management of the international nurseries data, ICADET for database management, and MAS for management accounting system. In the more recent period (1990 onward), a large number of databases became available for the use of the scientists, such as the Meteorological Database (METDB), the Plant Genetics Database and SEEDMAN, which were developed with modern relational database management systems to replace old applications. Crop trials data are being managed and analyzed using specialized software such as Agrobase and Genstat. Scientific data are being captured directly in the field using handheld computers and in the laboratory using specialized software. There is also a suite of applications for financial and administrative purposes.

Biometrics

A biometrician, appointed in 1989, has been assisting in enhancing the quality of research information by sound planning of the experiments/surveys, development of suitable statistical techniques, data analysis and inferences, and data presentation. He assists in choosing appropriate designs for crop variety trials and natural resource management trials, guided by the nature of input-factors and the environmental conditions. Data analysis methods incorporate features of spatial variability in the field trials. A number of biometric techniques have been developed to exploit breeding approaches in the areas of genotype environment interaction and quantitative genetics. An index to measure the transferability of a crop variety to the target areas of production has also been developed. Biometric Services also provide statisti-

cal procedures for estimating the sustainability of cropping systems and management of input factors in long-term crop rotation trials. Computing tools for biometric techniques are also provided to ICARDA and NARS scientists.

Tel Hadya Research Station

In Chapter 3 we presented the story of how the Tel Hadya farm was acquired. In October 1977 the first activities at this farm were to plough and prepare 150 hectares of land for the first year's planting of ICARDA's trials. The plan was originally to prepare the site for the work of about 30 scientists. The number increased to over 60 within a decade. By 1980 the first 'temporary' buildings (which are still being used) were constructed into two quarry bays at the upper part of the station. These quarries were the result of former stone breaking, the construction of over 60 km of road inside the station.

Concurrently with site preparation was the procurement of field and laboratory equipment, as well as vehicles. A cost-efficient solution was to make use of equipment and vehicles purchased from the Excess Property Division of the US Army. This proved to be an appropriate first generation of equipment. However, their gradual replacement with new and more economic models became a pressing necessity, and it was indeed a valuable and most cost-effective deal.

With the gradual increase in the number of scientists, land availability continued to be a recurring issue, with no solution to the problem of always having some areas being continuously used for breeders' work. Until 1996 only about half the area used for research was permanently allocated to the users, which meant that most of the area required for cereal and legume breeding, their nurseries and basic seed production had to be newly allocated each season. More recently, in 1996, the merger of the Cereals and Legume Improvement Programmes made it possible to attempt a permanent allocation to scientists.

The station had to be adapted to changing needs, and as labour shortages occurred at peak times each growing sea-

son. Weed control continued to be the over-riding problem, and in the beginning was mostly done manually. At present a combination of crop rotations, a cautious use of herbicides, mechanical methods and hand weeding is used. The most serious weed, *Orobanche* spp. is still controlled by hand. However, a herbicide has become available recently to control *Orobanche* spp. in some legumes, such as lentil and vetches.

Greenhouses

ICARDA also has developed a greenhouse facility of about 7000 m≈ at Tel Hadya. The first set was completed in 1978. The second, thought to replace the old structures, was completed in 1989. Even before the new ones were finished, claims were made to continue using the old ones, although they are simple structures, single covered, with practically no cooling systems and, therefore not usable from April to November. So, the old as well as the new greenhouses are still in constant use.

The Hill

The hill in the Center of ICARDA's station deserves a mention. At present, large parts of it are used for grazing, and a small part is planted with trees, and includes a picnic area. An arboretum with some important tree crops of the region, such as olives, pictachio, almonds, carob, quinces and pomegranates has also been started.

Remnants of historic material are prominent and often discovered as new sites are dug up for building. More than a dozen cisterns, very likely used for water storage have been found and one of them was cleaned in 1990/91. Pottery finds have also been restored and are displayed in the lobby of ICARDA's main building.

Excavation carried out by the Director of Antiquities revealed some secondary building foundations at the hilltop, and also included a structure described as a 'winepress.' A precise dating of all these structures has not been made, but the pottery found in the cistern is thought to date from the

Ayyubid period, i.e. the 13th century. These cisterns, together with a water channel, likely from the 3rd century A.D., found approximately 2 km north of the hill, strongly suggest that the area has been used for settlements since early times. Further, it indicates that water was difficult to secure even at that period of time.

5

Human Resource Development

During the 25 years of its life, ICARDA has offered training opportunities to over 11,000 agricultural scientists from more than 92 countries, from both within the region and elsewhere. The presence of such a cadre of the Centre's trained 'alumni' has contributed significantly to the close and healthy relationship that ICARDA enjoys today with its national partners and with many research and training institutions worldwide. ICARDA sees its ex-trainees as its 'ambassadors' forever.

From its inception, ICARDA set out to enhance the research capacity of the national systems in the region and beyond. Stemming from the Skilbeck Report and until today, human resource development and capacity building have been integral components of its overall activities. It has consistently recognised that quality research cannot be achieved without a well-trained cadre of scientists at its own precincts, but even more so, at the global, regional and national levels.

Of course, other national, regional and international institutions already had ongoing training programmes on the crops mandated to ICARDA. Besides the national institutions within ICARDA's region, the Ford Foundation's ALAD Program and the FAO were significantly active in training in the WANA region well before ICARDA was established. The national agricultural research systems (NARS), FAO, the Arab Centre for the Studies of Arid Zones and Dry Lands (ACSAD) and the Arab Organization for Agricultural

Development (AOAD) have made key and sustained contributions too.

The Early Days

A modest number of training participants took part when, with limited resources, ICARDA conducted its first training activities in Aleppo during the 1977/78 cropping season. Since then, participants and countries being served, as well as the training courses, have increased steadily in number. At the same time the courses have become increasingly focussed and demand-driven, designed to respond to the evolving human resource development needs in the countries of Central and West Asia and North Africa (CWANA) in particular, and in other countries of the world as well.

Identification of the training needs of national research scientists during the early years often challenged ICARDA's training personnel. At first, invitations for courses were addressed to the Ministries of Agriculture. The intention was to establish links and build awareness of the training opportunities offered by ICARDA to the central policy executives in the respective countries. However, the Ministries, through their national programs, often nominated training participants on an ad hoc basis, which did not always lead to selection of the most appropriate candidates. Learning from this experience, the following three alternative procedures were adopted.

The first was through response to direct requests. The second was to follow up leads on likely candidates through information gathered by ICARDA scientists during their field trips. The third and most effective procedure was through the annual regional, sub-regional and national coordination meetings in which ICARDA scientists meet with national scientists to agree on a well-focussed agenda of research programs and identify specific areas in which training was needed. This way, training requirements were discussed with directors of research and other concerned senior officials from the countries involved. Their professional contributions significantly improved the quality and relevance

of ICARDA's input to the research agenda of their countries, and the identification of critical areas for training in research. The first countries to adopt this modality of training strategy were Sudan and Egypt through the Nile Valley Faba Bean Project. With gradual refinements, the same approach was adopted for all countries in CWANA.

The role of ICARDA throughout this continuous activity has always been a supporting one under the leadership of national scientists. Throughout the years, this style has prevailed. Along with the research work plans, training demands are usually presented by national scientists and finalised during the coordination meetings between NARS and ICARDA.

Evolution of Training Activities

The interaction with national programs influenced the evolution of training offered by ICARDA. After the extensive skill-oriented training offered in the early courses, (when a six-months course spanning the cropping season was the standard), the national programs soon demanded shorter specialised courses, e.g. on breeding strategies for biotic and abiotic stresses, integrated pest management, Geographical Information Systems and Remote Sensing, biotechnology and genetic engineering, management of natural resources including water, soil and plant cover, seed production and testing etc. These started in 1981 and grew to cover diverse topics. The Centre's current training program includes long-term group courses, specialised short-term group courses, individual non-degree and degree (MSc and PhD) courses, and regional, sub-regional and in-country courses. Over the years, with their increasing human resource capabilities, national programmes are assuming a greater role as ICARDA's partners in implementing and conducting its training programmes.

From the start, it was clear that training participants would need continued support even after returning to their home countries. They were, therefore, encouraged to maintain their linkage with ICARDA so that they would continue

to update their inputs. ICARDA kept supplying them with publications and with seeds to start their own experiments. Contacts through visits was a routine modality in this collaborative endeavour.

In the learning process, it became clear that technicians supporting national scientists invariably needed training in field-oriented skills. However, it was not cost effective to bring the technicians to ICARDA headquarters. Instead, the trainers went to the trainees. The first national training course was held at Hudeiba Research Station in Sudan in January 1981 as part of the Nile Valley Faba Bean Project. Sudanese and Egyptian scientists led the course, with the participation of ICARDA scientists. This interaction heralded a great leap forward.

Regular national and regional courses soon followed, and these evolved to become an important tool in training large numbers of scientists and their support staff. In addition, the platform of regional courses provided scientists from ICARDA and national programs with opportunities to discuss strategies for further collaboration. In 1984, for example, the Pakistan Agricultural Research Institute and ICARDA held a food legume hybridisation course in Islamabad. The course was followed by a two-day meeting in which ICARDA and national scientists met to discuss collaboration in breeding for ascochyta blight resistance. The resulting manual is still in use today. Several other in-country, subregional and regional training courses were conducted during the early days in Egypt, Syria, Yemen and other countries.

Links with WANA Universities

ICARDA was aware of the need to boost its training efforts by forging strong bonds with national universities. Joint courses trained large numbers of scientists in the region by combining the resources of the partners. The Centre signed agreements with universities in WANA for collaboration in various forms, the first being with ICARDA's neighbour, the University of Aleppo. This paved the road for agreements with other universities, thereby boosting the standard of

postgraduate studies considerably by tapping into the talents of the able staff in many universities. Naturally, the student research contributed to solving the problems of farmers in their home countries and beyond. As an example, IDRC funding helped a scientist from Tunisia to start a project that generated wilt-resistant chickpea and lentil genotypes for North Africa, *Orobanche*-resistant faba bean in Egypt and high-yielding durum wheat varieties in Syria. Now, ICARDA has collaborative research agreements with 50 universities in this region.

North/South Links

Right from its early years, ICARDA has endeavoured to develop training avenues with advanced research and teaching institutions in Europe and North America. This activity increased in time, and has been better focussed in quality. This ever-widening network is gradually leading to joint ventures in training at an increasingly high level of performance.

Where training is needed outside of ICARDA's research mandate, the Centre plays a catalytic role and seeks appropriate training opportunities at other research or training institutions worldwide. Examples of such special training activities include ICARDA's services to the Southern Regional Agricultural Development Project (SRADP) in Syria, supported by UNDP, AFESD, IFAD and the World Bank. Between 1994 and 1996, more than 30 different specialised training courses were planned and jointly conducted with advanced research and training institutes in Egypt, Kuwait, Morocco, Tunisia and the USA. Several of such south-south and south to north linkages in training were provided to other special funded projects such as the Matrouh Resources Management project in Egypt, Iran Project in Iran and the World Bank project in Yemen.

Postgraduate Training

Although a Graduate Training Program (GRTP) started early at ICARDA, it gained momentum in 1984 when national pro-

grams requested increased support from the Centre for their researchers to obtain higher degrees. As part of the expanded graduate training activities, three candidates each from Egypt and Sudan, who were collaborating with ICARDA within its Nile Valley Faba Bean Project, were sent abroad to conduct research on faba bean for M.Sc./Ph.D. degrees.

The popularity of GRTP with national programmes increased fast. To meet the increasing demand and based on its usefulness to developing countries, ICARDA succeeded in securing financial support for this activity from the Ford Foundation for a five-year period (1984-90). When this support ended, AFESD came forward to partially support the program. To the extent possible, the program is also supported from ICARDA's core budget.

Table 1. Training at ICARDA, 1977-2001

Type of training /year	Long-term group training	Short-term Training		Individual		Total
		Head-quarters	Non-headquarters	Non-degree	Degree	
1978	26	-	-	-	-	26
1979	45	19	-	-	2	66
1980	42	6	-	4	3	55
1981	18	13	14	6	4	55
1982	24	49	40	6	6	125
1983	52	34	35	6	1	128
1984	25	60	91	23	4	203
1985	41	52	77	40	13	223
1986	70	58	176	71	22	397
1987	54	65	90	69	35	313
1988	59	78	337	77	39	590
1989	55	109	211	113	37	525
1990	44	179	340	90	40	693
1991	16	216	372	96	44	744
1992	16	171	371	113	45	716
1993	14	111	394	83	57	659
1994	12	102	294	81	63	552
1995	10	84	465	90	68	717
1996	11	146	369	84	58	668
1997	9	140	504	98	65	816
1998	-	171	521	106	67	865
1999	-	207	353	87	71	718
2000	-	152	287	106	68	613
2001	-	111	350	81	64	606
Total	**643**	**2333**	**5691**	**1530**	**876**	**11073**

The graduate training strategy is designed to benefit both national partners and ICARDA. National scientists, identified for graduate training, conduct research on topics within the research agenda of ICARDA at the Centre's facilities and at the universities they are registered with, both within the region and in industrialised countries. More than 450 national scientists from several developing and industrialized countries have completed their M.Sc. and/or Ph.D. degrees within the GRTP, and have returned to positions of responsibility in their countries. ICARDA operates this cooperative endeavour with universities in Egypt, Jordan, Lebanon, Sudan, Syria and Turkey, as well as with more than 50 advanced research institutions and universities in the Asia, Australia, Canada, Europe and USA.

Training Material and Backup Support

There has been a steady evolution in the training materials produced by ICARDA. During the early years of the Centre, several training manuals on cereals and food legumes were published. During the mid-eighties, training scientists introduced visuals and tape narration, which covered skill-oriented topics including crossing techniques used in crop improvement. However, the demand for training material from national programs has continued to rise, and ICARDA has been producing new material, using both print and electronic media. This includes laboratory manuals, field guides, and multimedia self-learning CD-ROMs and videotapes.

Production of training material is now a joint responsibility of Human Resources Development Unit and the Communication, Documentation and Information Services (CODIS).

Regional Specialisation

The strengthening of ICARDA's networks in the WANA countries led to specialised research and training on a regional basis. In North Africa, Tunisia was chosen as the focal point for chickpea and lentil fusarium wilt research,

Algeria for mechanical harvesting and Morocco for research on faba bean diseases and Hessian fly resistance. Concentrating talent and expertise in this way made it easier to run regional courses for technicians from the three countries.

Prompted by the success of these collaborative efforts, ICARDA and the three national programs in North Africa developed an integrated plan for the transfer of research results to farmers. Training focussed on winter sowing of chickpea and mechanical harvesting of lentil, with regional courses focussing on seed production and extension of the research results. A similar approach was followed for the cereal and forage crops, allowing the Centre to have a dynamic network in the region. Training has also played a vital role in spreading results to the farming community through on-farm trials and through direct exposure of farmers to new technology.

Training in ICARDA's Organizational Structure

During the early years, both training and communication were placed within one program—Training and Communication (T&C). It was believed then that the two functions could benefit from this organic linkage. Each of the other four programs, covering cereal improvement, food legumes improvement, pasture and forage improvement, and farming systems, had a full-time training scientist who reported on technical issues to the program leader concerned and on administrative issues to the leader of T&C. The theoretical aspects of the training programs were offered in Aleppo, while the field training was given at ICARDA's research stations at Tel Hadya, Breda, Khanasser and at the high elevation station in Sarghaya, near Damascus. The first residential long-term group training courses in farming systems, cereal improvement, legume improvement and pasture and forage improvement were offered for six-month periods in 1978. These courses were designed for newly graduated scientists and technicians from NARS, and were based on learning-by-doing. Each participant was assigned a specific project(s) in his/her area of interest and was required to

gather the necessary field data, participate in the field evaluation and crop harvesting, analyse the data and make a presentation to his/her colleagues at the end of the training period.

The trainees were usually assigned the planting of ICARDA's summer (off-season) nurseries, in the high elevation locations in Syria, as well as in several other locations in Lebanon, Jordan and Turkey. This improved their knowledge and skills as well as provided them with unique opportunities to visit other countries and interact with counterparts in the region. Unfortunately, budget limitations and other constraints necessitated the reduction of these courses to four-month periods or less after 1985 for the Cereal and Legume Improvement Programs. In 1991, all long-term courses were discontinued.

Training and communication functions continued to operate under one program until 1980 when it was realised that a change was needed for better coordination of Centre-wide training activities, as well as communication activities. By 1982, the two functions were separated. In 1983, the first External Program Review (EPR) team recommended the establishment of a Training Coordination Unit (TCU). This step insured coordinated training policies in ICARDA and a central node for communication with national programs. A separate Communication and Documentation (C&D) Unit was established at the same time.

Subsequently, in 1997, to cope with the shortfall in the Centre's funding, the visitors' services, scientific meetings, workshops and conferences, and transportation and telecommunication services were placed under TCU, and the expanded unit was named Human Resource Development Unit (HRDU).

Shifts in Training at ICARDA

Table 1 on page 86 shows the range of training courses and the number of training participants for the period 1977 to 2001. It reflects the shifts both in number of training participants and location of courses, which took place in response to the recommendations of the external reviews, in-house

planning, changing budget climate, and NARS priorities. Emphasis on training in new science, including remote sensing, geographical information systems, biotechnology, expert systems, scientific writing and information technology is increasing in response to demand from NARS.

6

Disseminating Scientific Information

Information Management

Information is the life-blood of research. Although ICARDA inherited a modest library from ALAD, it recognised the importance of access to latest information not only by its own staff but also by NARS researchers. Dissemination of research results through publication in the international refereed journals was another constraint, primarily because of inadequate writing skills and the lack of facilities to produce high-quality manuscripts.

To address these areas of ICARDA's programme, a Training and Communication (T&C) Unit was established right after the inception of the Center. As stated earlier, training was subsequently separated, and the Unit was named Communication and Documentation (C&D) in 1982, which became Scientific and Technical Information Programme (STIP) in 1986, and Communication, Documentation and Information Services (CODIS) in 1991 (and continues to have

this name to date). These name changes point to, and underpin, the growth in strength of this vital programme.

The Library has evolved from a conventional reading room to a modern information-technology-driven information pool, and currently holds over 24,000 accessions. CDS/ISIS was adopted as the bibliographic database management system. The entire inventory of holdings has been computerised, and the old cardex system abandoned.

The services provided by the Library to ICARDA and NARS researchers include literature searches; reference services; access to journal and document collections; training in information management; and publication exchange. Several manual operations, particularly literature searches for NARS, have been replaced by computerised systems. Provision of e-mail at ICARDA and in most NARS has led to an increased number of requests from NARS researchers for literature searches and document delivery.

With its impressive collection of books and journals, both in print and CD-ROM formats, the ICARDA Information Unit is now considered one of the best reference sources in the region. Three CD-ROM towers, each with a capacity of hosting seven CDs, allow the users on-line access to a large number of databases from their PCs at Tel Hadya through the local area network. In addition, electronic versions of a wide range of journals are now accessible to ICARDA researchers on the World-Wide Web. The Library pages on ICARDA's website on the Internet provide links to a large number of scientific newsletters, magazines and other reference sources.

Scientific Publishing

One of the major initiatives to overcome the problem of publishing research results, primarily those of NARS, was the launching of three scientific newsletters: FABIS on faba bean, LENS on lentil and RACHIS on cereals. The articles received were reviewed by ICARDA researchers for quality (often ICARDA researchers co-authored the articles), edited and even rewritten by ICARDA editors, and the graphics were improved/redrawn to bring the manuscripts to the level of international quality for publishing. After serving the NARS

researchers for nearly 20 years, publication of these newsletters stopped in 1999 partly because of financial constraints and partly because the NARS researchers, over the years, improved their writing skills and, in many countries, established their own facilities to produce high-quality manuscripts for international journals.

Over the years, publishing at ICARDA has evolved both in quality and numbers. A variety of publications designed to meet the needs of its diverse audiences are produced each year. Currently, these are placed in the following categories: refereed scientific publications, non-refereed scientific publications, training publications and general-audience publications. The Centre has to date produced some 4000 publications. These include more than 1900 journal articles and conference papers, 570 major research reports, 71 directories and catalogues and 85 training publications.

Most of the publications are printed in-house at ICARDA's own fairly modern offset printing facility. With the introduction of desktop publishing in the mid-1990s at the Centre, several prepress operations, including typesetting, graphics, design and layout, which were done manually before, are now done using computer technology.

Arabic versions of all key publications, including the corporate Annual Report, field guides and laboratory manuals, are produced for the benefit of the Arabic-speaking audiences. Most of ICARDA publications are provided free to NARS researchers and libraries, and the Centre maintains a targetted mailing list to ensure that its publications reach the real users. However, a price list for a selection of publications is also available to generate some income to offset the production costs. Industrialised countries are the main clients for ICARDA's priced publications.

Multimedia

A multimedia laboratory was established in 1998 to produce public-awareness and training materials. A video to cover ICARDA's strategy, research programmes and partnerships was released in 1999. Several other videos have since been produced to cover the major events at ICARDA, as well as to

illustrate specific research activities. This effort is gaining momentum with the aim to produce ready-to-use videos for TV stations in the region to promote ICARDA's research achievements. The 2000 Annual Report was the first to be published on CD-ROM. Five interactive self-learning CD-ROMs have been produced to cover some key areas of research for the benefit of NARS researchers.

ICARDA has been a leader in the CGIAR System in establishing an electronic photolibrary. Over 15,000 slides have been scanned and added to the 'image bank' of the Centre. This facility makes the database easily searchable, and ensures that the Centre's memory is preserved.

Public Awareness

ICARDA's emphasis on public awareness has been increasing over the years. The Centre uses both print and electronic media to promote public awareness of the importance of its work and achievements.

An increasing number of press releases, features stories, flyers, information brochures and posters are published every year. A general-audience publication, *ICARDA Caravan*, was launched in 1995, which has established itself as one of the best public awareness tools. To meet the information needs of ICARDA staff and the Board of Trustees, a weekly newsletter *The Week at ICARDA* is produced. A targetted series *Ties that Bind* is devoted to meet the information needs of specific donors. Each booklet highlights the joint work with a specific country, both in the developing and industrialised world.

The Centre has established linkages with media representatives both within and outside the CWANA region. As a result, ICARDA now frequently features in local, regional and international newspapers and magazines, as well as on TV channels. In addition, participation in agricultural exhibitions adds another dimension to the public awareness efforts of the Centre.

A key tool in promoting public awareness about ICARDA's research strategy, program of work and partnerships has been its website (www.icarda.cgiar.org) established

in 1999. The Centre's site recorded more than 408,000 hits during about 281,000 visitor sessions originating from 140 countries in 2001. Among the most active countries in Central and West Asia and North Africa were: Armenia, Bahrain, Cyprus, Egypt, Eritrea, Ethiopia, Greece, Jordan, Kazakstan, Kuwait, Lebanon, Mauritania, Morocco, Oman, Pakistan, Qatar, Turkey, Turkmenistan, Uzbekistan, and Yemen.

Not surprisingly, the home page was the main page visited, followed by a page with general information about the Centre. A page guiding people to information about ICARDA's research themes, programs, and projects garnered the next highest number of hits, followed by a page describing the Centre's publications, and training activities.

Promoting Information Technology Use

Recognising the need to promote the use of information technology, ICARDA started offering an annual headquarters training course in information management in 1996. To date, 70 participants from 20 countries have benefitted from this initiative. Similarly, an annual headquarters training course in scientific writing and data presentation has benefitted 205 participants from 24 countries.

Collaboration

CODIS participates actively in the FAO's AGRIS (International Information System for Agricultural Science and Technology) and CARIS (Current Agricultural Research Information System) systems. This ensures the availability of all ICARDA documents to the international scientific community through these FAO databases, available free on the Internet. The Unit also participates in the inter-centre initiative on the development of a Union List of Serials Holdings.

Through an agreement with CIMMYT, and in collaboration with ISI (Institute for Scientific Information) and AGRIS, FAO, a bibliographic service on barley, wheat and tritcale is available for the benefit of the ICARDA and CIMMYT clientele. The product is named *Literature Update on Wheat, Barley and Triticale.* In collaboration with the Centre for Legumes in

Mediterranean Agriculture (CLIMA) in Australia, a comprehensive bibliography on *Lathyrus* has been published both in print and CD-ROM formats.

Within the framework of the ICARDA/Syria collaborative programme, CODIS developed an agreement with the National Centre for Agricultural Information and Documentation (NCAID) and with the Directorate for Agricultural Scientific Research (DASR), Douma, Syria. ICARDA helped the two centres in establishing their information systems by developing their databases and automating some of their library functions, and providing training in CDS/ISIS and AGRIS methodologies.

Another example of providing support to NARS in strengthening their information technology capability was the development of an Information Strategy for the Ethiopian Agricultural Research Organisation (EARO), jointly undertaken by CODIS with Computer and Biometric Services and other Programs of ICARDA.

7

International Cooperation

Introduction

In the arena of international cooperation, ICARDA was born on its feet and running–thanks to its forebears. The Arid Lands Agricultural Development (ALAD) programme of the Ford Foundation and FAO had established fine networks of research and training with almost all the countries of West Asia and North Africa (WANA). The ALAD programme concentrated on wheat and food legumes and, to a lesser extent, on barley, pasture and fodder crops. Since the ALAD initiative started a decade before ICARDA came on the scene, some improved and high-yielding crop varieties had already been introduced into the WANA region. Almost all the national agricultural research system (NARS) scientists were involved in testing the new germplasm in their respective varied environments; they undertook breeding and selection work of what proved later to be both adapted and best yielding material in a region extending from Pakistan in the east to Morocco in the west, and from Turkey in the north to Sudan in the south. Indeed, most, if not all, of the scientists and technicians involved in this activity were trained initially by these two organisations.

There were also several other institutions actively involved in research on basic food crops in the WANA region. These included CIMMYT on wheat and maize, IRRI

on rice and ICRISAT (to a limited extent) on sorghum, millets and chickpea. Other participants included USAID, Sweden, Denmark and France, FAO/UNDP at country and regional levels, and Ford and Rockefeller Foundations in such countries as Egypt, Pakistan, Tunisia and Turkey. Collaborative university activities were pursued in both research and training, e.g. by Oregon and Nebraska universities. According to several sources, including CIMMYT and FAO, there had been notable achievements in such countries as Algeria, Egypt, Lebanon, Iran, Pakistan, Sudan, Tunisia and Turkey.

Other partners in these activities (particularly in training) were the Arab Organisation for Agricultural Development (AOAD), located in Khartoum, the Arab Centre for the Studies of Arid Zones and Dry Lands (ACSAD) in Damascus and, of course, the unstructured network of liaison between the national agricultural research and training institutes, including universities, within the countries of the WANA region. At that stage, however, AOAD and ACSAD had just started.

Thus, if ICARDA's creation was blemished physically by turmoil and wars, its infant steps into collaborative work with national programmes were well paved. The Centre found the ground fairly well prepared for immediate collaborative action with NARS, and a basic infrastructure of research and training was already in operation.

Constraints

The national institutions and their respective scientists were (and some still are) hindered to varying degrees by daunting bureaucratic obstacles, scarce resources, poor motivation and other constraints. Weakness in coordination at the national level was then clearly a major constraint, first identified in the Skilbeck Report (1973). It had this to say on the subject (para 148 and 150):

"*Agricultural research is frequently conducted by several independent Ministries and specialised institutions, thus militating against multidisciplinary research and leading to the proliferation*

of isolated, disconnected programmes and efforts. As exceptions, the accelerated wheat improvement programmes of Pakistan, Algeria and Tunisia may be quoted as excellent examples of what can, and has been, achieved by an interdisciplinary national effort on a very major and urgent issue.

There are many examples of research coordination at the national level, amongst which may be noted the Central Agricultural Research Council of Pakistan, the Agricultural Research Centre of Egypt, which administers all the agricultural research stations, and the Higher Agricultural Council of Iraq, which acts as a coordinating body. Such bodies have an important role to play, but without adequate autonomy and restricted by organisational constraints, they can scarcely hope to achieve their potential impact. The Agricultural Research Institute of Lebanon may be quoted as an interesting example of an organisation working within the autonomy of its own governing body, which has considerable responsibility for its associated research stations. It is also interesting to note the plans being formulated in Algeria to establish three research institutes; one to deal with cereals, one with grain legumes and vegetables, and one with arid zone and desert problems. These three institutions are to be set up in order to assist in the better coordination of adaptive research."

Motivation

Then the Skilbeck report touches on an often-neglected yet extremely vital factor—motivation of personnel. If not properly addressed, this can significantly retard effective delivery of research/training programmes, if not reduce the whole endeavour to insignificance. The report states (para 155 and 156):

"*Fundamentally, the quality of research work in any country depends on the quality of the research worker, who must be both well trained and properly motivated. Much more emphasis needs to be given to post first-degree training and, insofar as it is possible, to candidate selection for research posts. The further need for regular in-service training is vital if research workers are to be given full opportunity to keep abreast of developments and to 'recharge their batteries.'*

It is scarcely surprising that motivation often leaves much to be desired. Salary scales are generally exceedingly poor, working conditions, facilities and equipment are often primitive, and there is too frequently a lack of drive and inspiration coming from senior research workers on whom the young research worker must expect to rely so much in his formative years. In particular, there is a great lack of understanding of the importance of development-oriented research. The combination of these factors is not conducive to the production of good work."

The Network and NARS

In addition to its basic mission of research and training within the limits of its global and regional mandated crops, ICARDA was to fill that basic and, indeed, strategic niche of a lead coordinator in the WANA region. Before its creation, other 'players' endeavoured to cover this role in a temporary and, perforce, somewhat discordant way. ICARDA was to assume the multi-faceted role described in the Skilbeck report as: "*...(to) complement, inspire and aid in the coordination of all that is currently being undertaken at national and regional levels, assisted by multilateral and bilateral aid.*" This is exactly what ICARDA has increasingly done over the last 25 years, both with and among the NARS on the one hand, while interfacing with collaborative schemes with up-stream institutions, both globally and regionally, on the other.

The ICARDA Region

ICARDA's regional geographic mandate in WANA covered 27 countries until 1996 when it was extended by the CGIAR to cover the Central Asia and the Caucasus region, which includes eight countries that emerged from the former Soviet Union (Fig. 1). Thus, ICARDA's regional geographic mandate now covers 35 countries, and the region is referred to as CWANA (Central and West Asia and North Africa).

Reorganizing the agroecological diversity of the region, ICARDA's approach is to meet the NARS' needs through a chain of regional programmes representing major agroeco-

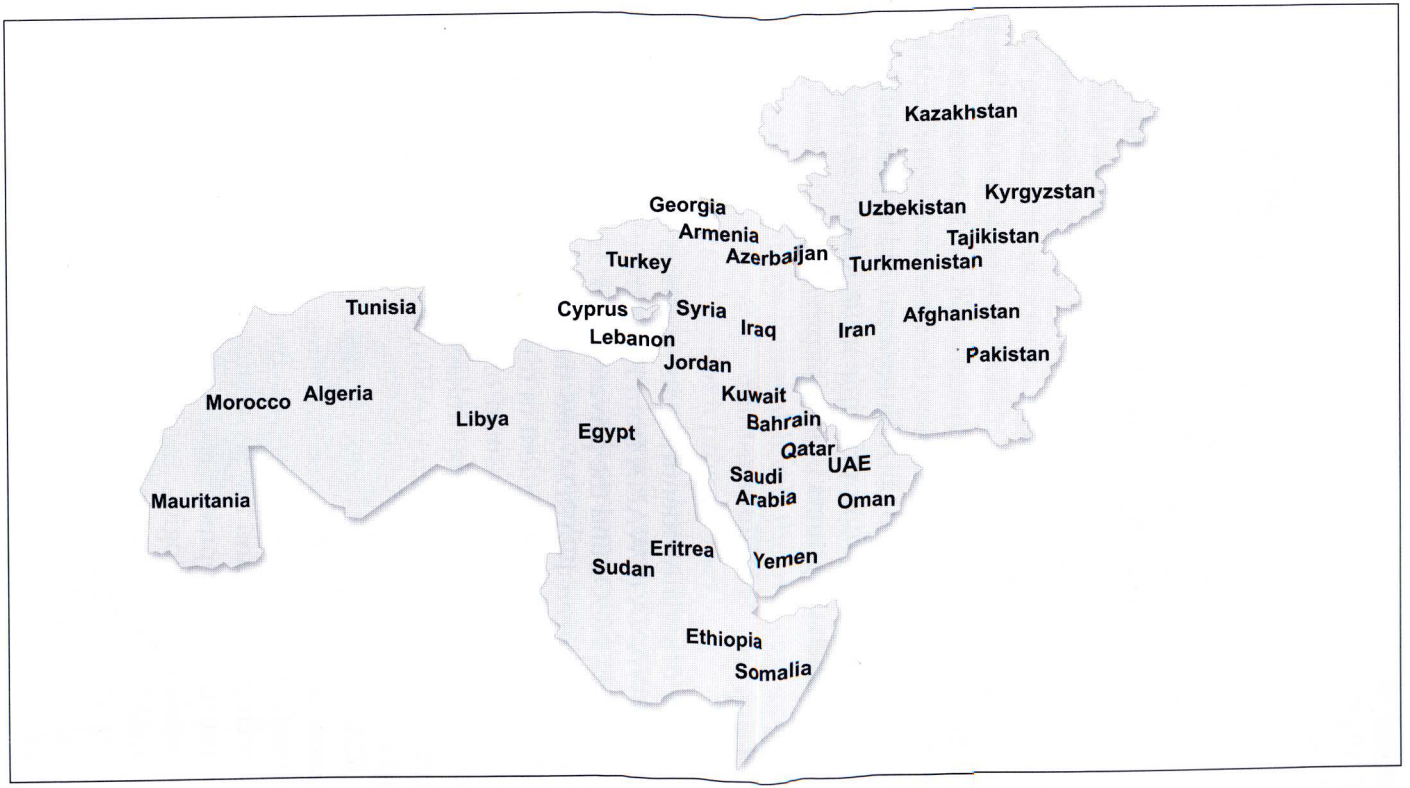


Fig. 1. The Central and West Asia and North Africa (CWANA) region.

logical and geographic zones in its region. In these, ICARDA's role is essentially to work in partnership with the NARS to encourage the sharing of information, technical know-how and experience, and to offer training, promote innovation, provide germplasm, and, whenever possible, help to target resources from donor agencies.

As an outward-looking Centre, ICARDA continues to be aware of the importance of maintaining a strong and mature partnership with national research institutions and associated services. In a region undergoing major socioeconomic adjustments, it is only through continuous interaction with its research partners that ICARDA can endeavour to keep abreast of evolving and emerging needs and new opportunities. Such interactions have been the hallmark of the Centre's work in the past, and their maintenance and furtherance will continue to be a guiding principle in its future relationships with its national partners.

Strategy

ICARDA originally identified its partners as the governments of WANA (CWANA from 1996), their NARS and their universities, NGOs and the private sector. However, the relationship between ICARDA and the NARS of CWANA has been evolving. A key element in this process is the emphasis on genuine partnership instead of an over-dependent client relationship, and fostering linkages between NARS and advanced research institutes (ARIs) within and beyond the region.

ICARDA views its role in developing regional programmes and networks as an integral part of its global research efforts. This involves the joint formulation of research priorities and the generation of new scientific information, the development and validation of improved and appropriate technologies, and the demonstration and subsequent adoption of new or improved technologies by farmers. The strategic approach adopted by the Centre has received strong endorsement from the governments of CWANA countries. For example, the Ministers of Agriculture at FAO

Regional Conference for the Near East, held in March 2000 in Beirut, Lebanon, unanimously adopted a resolution to support ICARDA's mission and the role it is playing in strengthening agricultural research for food security and protection of natural resources. The Ministerial Meeting in Rabat in 2001, convinced of ICARDA's achievements in research and training, assigned the Center with the coordinating role for a major regional program on enhancement of agricultural productivity and management of natural resources in rainfed areas of WANA.

Outreach programmes and networks involve all of ICARDA's activities, constituting some of the strongest links among them. It is the outreach mechanism that ensures a two-way research continuum between ICARDA and NARS (Fig. 2). In its work strategy, ICARDA capitalises on NARS' strength, and bridges the gaps through technical backstopping, provision of germplasm and through human resource development. At the national level, the strategy involves a multi-disciplinary and multi-institutional approach in focussed agricultural research programmes.

At the regional and sub-regional levels, the strategy aims to develop complementary themes research programmes. The national agricultural research systems vary considerably in their stage of development, capabilities and needs, and continue to be constrained by inadequate financial resources and, in certain cases, weak research organisations. Strengths within certain NARS remain fragile, and the huge disparities

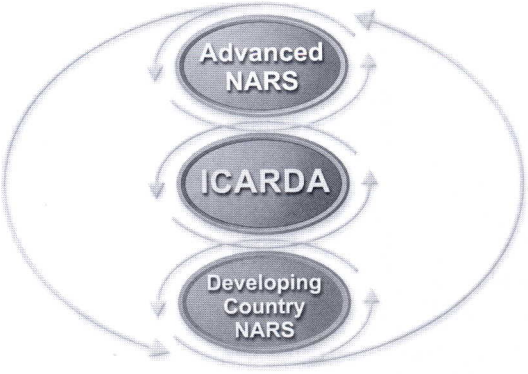


Fig. 2. The Research Continuum

in capabilities pose issues of residual responsibilities, even when devolution of certain activities occurs. Through increased regionalisation and networking, ICARDA strives to increase inter-country cooperation in agricultural research. Thus, outsourcing and technical affiliation with strong NARS is an important component of ICARDA's strategy to foster partnership, and to serve not only the involved NARS, but also the entire CWANA region.

Outreach Programmes

ICARDA has seven regional programmes (Fig. 3), which continue to provide the major mechanisms for sustaining the ICARDA/NARS research continuum, additionally supported through training and documentation and information services. A Regional Coordinator leads each regional programme, with support from appropriate staff. These programmes are: the Nile Valley and Red Sea Regional Programme (NVRSRP), North Africa Regional Programme (NARP), Highland Regional Programme (HRP), West Asia Regional Programme (WARP), Latin America Regional Programme (LARP), Arabian Peninsula Regional Programme (APRP), and Central Asia and the Caucasus Regional Programme (CACRP).

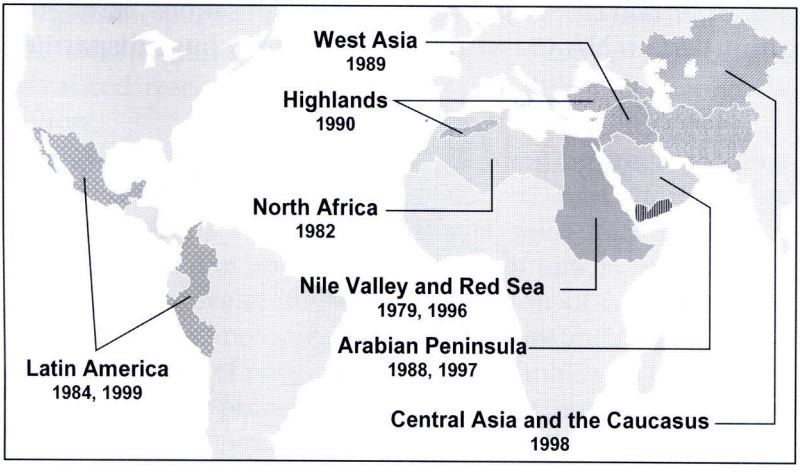


Fig. 3. Regional Programmes of ICARDA

NARS/ICARDA annual National and Regional Coordination Meetings are considered a distinctive feature of ICARDA's outreach programmes. During the early stages of the NARS/ICARDA relationship, ICARDA played a major role in organising the annual National Coordination Meetings in which research results of previous seasons were presented and discussed, and the next season's work plans jointly developed. Research leadership, implementation and reporting were the full responsibility of the national research partner, with technical backstopping from ICARDA and other CGIAR centres. Over time, ICARDA reduced its involvement in National Meetings and now places more emphasis on Regional Coordination Meetings and Regional Travelling Workshops, where problems of common interest are tackled through a multi-disciplinary, multi-institutional and multinational approach. Complementary inputs in research activities at the regional level allow an efficient use of the human and physical resources available to the NARS. Financial requirements for joint NARS/ICARDA work plans are met through special projects that reflect a tripartite cooperation involving the NARS, ICARDA and the donor community.

Nile Valley and Red Sea Regional Programme

Background

Cooperation between Egypt, Sudan and ICARDA through the Nile Valley Project (NVP) started soon after ICARDA's establishment in 1977. The NVP was established in 1979 as the first of ICARDA's outreach endeavours. The rationale for the establishment of this programme was that faba bean was a global ICARDA-mandated crop, and that ta major proportion of population in ICARDA's mandate are depended on this crop for its basic food needs. ICARDA was daring but wise to have taken this step. The NVP was later used as a model to establish other regional programmes and, therefore, deserves to be described in greater detail.

Structure

In 1979, the NVP was established to improve faba bean research and production in Egypt and Sudan. In 1985, Ethiopia joined the project. Because of the impact of NVP on increasing faba bean production in the countries involved, it was expanded in 1988 to become the Nile Valley Regional Programme (NVRP) on cool-season food legumes and cereals. Since that time, it has focussed on the improvement of faba bean, lentil, chickpea, field pea, grasspea, wheat, and barley in all or some of the participating countries—Egypt, Sudan and Ethiopia (from 1985). A significant and sustained input of socio-economic research was also included.

Although natural resource management was added only to the Egyptian component in 1993, the concept of sustainability of the production systems is inherent in all NVRP activities. Another country, Yemen, joined the programme in 1995, and subsequently the name was changed to the Nile Valley and Red Sea Regional Programme (NVRSRP), although, for simplicity, it will be referred to as NVRP throughout this chapter. Eritrea signed an agreement with ICARDA in 1995, and now has collaborative research with centre in barley, seed production and cereal diseases. Another component added to the programme in 1995 was the Regional Networks Project. This project was designed to help the countries of the region to cooperate in strengthening basic and applied research on problems of common interest.

NVRP is coordinated by a Regional Coordinator, based in the programme's regional office in Cairo, Egypt. Not only does NVRP involve cooperation among the official partners, but also a dynamic interaction with other CGIAR sister centres, particularly CIMMYT in wheat, ICRISAT in chickpea, and IWMI in water management research. The programme also has links with several regional and international organisations.

Objectives and Programmes

The main objectives of NVRP are to improve the productivity of cool-season food legumes and cereals, and ensure the

sustainability of production systems in different agroecological zones. This is to be attained by the development and transfer of improved agricultural production technologies to farmers, and by training. The inclusion of long-term resource management research for sustainable productivity in Egypt in 1994 has added yet another dimension.

The implementation strategy adopted for NVRP was based on capitalising on NARS strength and capabilities to undertake research, with technical backstopping from ICARDA and other CGIAR centres. Among the innovations pursued was the promotion of researcher-extensionist-farmer linkages. Technology is tested on farm, together with the adaptation of improved and environmentally safe production packages for small farmers. Uniquely, the key performers in NVRP are the national scientists of the countries involved, making it effective and sustainable.

Donors

Funding came initially from the International Fund for Agricultural Development (IFAD), itself then a new organisation. IFAD remained an important funding partner for nine years, covering three 3-year phases (1979/80-1987/88) of the project. Subsequently, and because of its impact, the project attracted support from several other donors: Italy, the European Union, the Netherlands, the Swedish Agency for Research Cooperation with Developing Countries (SAREC), and even Egypt and Sudan. The total funding provided to NVRP over the years of the programme amounts to more than US$35 million.

Achievements

NVP, NVRP and NVRSRP have all had a major impact on the outcome of back-up research, transfer of technology to farmers, institutional development and regional cooperation. The transfer of technology to farmers has impacted positively on national production, particularly of faba bean, wheat and lentil.

Through back-up research, more than 46 improved high-

yielding cultivars of all the crops addressed by NVP/NVRP in Egypt, Ethiopia and Sudan were developed and/or identified for various agroecological zones. Researchers also developed recommendations on cultural practices for local and improved cultivars; these constituted more than 30 improved production packages recommended to farmers under different agroecological conditions. They include, among others, improved cultivars, planting dates and methods, plant population densities, fertiliser use, Rhizobium inoculation and weed, disease and insect pest management.

All the packages developed in back-up research were demonstrated to farmers in several locations and sites in all three countries. A few examples are presented here on the impact of technology transferred to farmers.

Egypt: High levels of adoption reaching 77, 73, and 64% for improved irrigation regime, planting date and cultivars, respectively, were reported for wheat technology in Upper Egypt. Similarly, improved faba bean technology received wide acceptance. The contribution of technology development and transfer has been reflected in increased national production of the two crops. For example, faba bean production has steadily increased from 0.269 million tonne in 1997 to 0.442 million tonne in 1998. Wheat production has also doubled in Upper and Middle Egypt in this period.

Sudan: Wheat improvement in the Sudan provides a striking example of the impact of technology transfer. High and profitable wheat yields from demonstration plots encouraged the pursuit of self-sufficiency. The 1991/92 season witnessed high vertical expansion with sufficient production to cover domestic needs for the first time. Adoption levels of improved wheat technology components in various production areas were substantial, resulting in rising wheat production. Significant strides were also made in lentil production, largely due to technology development and government policies. With encouraging yields, production was boosted to reach self-sufficiency.

Ethiopia: Improved faba bean production packages in Ethiopia were shown to boost yields by about 0.25 tonne to 1.52 tonnes/ha in different areas in West and Northwest Shewa region and resulted in monetary benefits to farmers. Target farmers in the central zone of Ethiopia adopted recommended practices. Adoption levels for improved technologies in chickpea and lentil were similarly substantial. Developments in barley technology were reflected in high yield improvements on demonstration plots.

Human Resource Development

Staff education, training, conferences, workshops and professional visits were vital components of the programme. The NVRP provided training opportunities for six staff members to earn a Ph.D. in Europe and North Africa. These activities have contributed greatly to the development of strong multi-disciplinary research programmes and institutional delivery systems in the Nile Valley countries and beyond. Field and laboratory facilities of the national programmes have been upgraded. Linkages between researchers, extensionists and farmers have been significantly strengthened as a result.

Regional cooperation has been strengthened through formal and informal networks in specific research areas of common interest to the four participating countries. Joint planning and review of research, and exchange of germplasm, technical information and improved technology, in addition to participation in regional travelling workshops and regional coordination meetings, were the key elements of regional cooperation.

Conclusion

Now, over 23 years since the establishment of NVRP, ICARDA has a success story to tell from this first outreach programme that created a new model of collaborative research and training at country, regional and international levels. The key performers have been the national scientists of Egypt and Sudan, later followed by Ethiopia, Eritrea and Yemen.

North Africa Regional Programme

Background

Established in 1980, the North Africa Regional Programme (NARP) is ICARDA's second oldest regional outreach programme. It started by posting an ICARDA cereal breeder/pathologist in Tunisia (1980-1986), and was later strengthened by posting two food legume scientists: a breeder (until 1985) and an agronomist (1981-1985); and a farming systems specialist (1984-1987). ICARDA then established a regional office in Tunisia in 1984 that covered activities in Algeria, Libya, Morocco, Tunisia and, more recently (1999), Mauritania.

The posting of scientists in North Africa peaked in 1990. At that time, ICARDA had five scientists working in Morocco, while only the Regional Coordinator was working from the Tunisia office. Three scientists were posted in 1986-87: a barley breeder, a food legume breeder and a forage and pasture specialist. Two scientists participated in devolving the faba bean programme to Morocco in 1989 upon the request of TAC: a faba bean breeder and a faba bean pathologist. Upon the return of the Moroccan scientists who had been studying abroad, ICARDA devolved the responsibilities for crop improvement to the national scientists, and phased out its direct involvement in this programme in 1993. At that time, only two of the five scientists were left, one of whom was a food legume pathologist who later became the Regional Coordinator of the Highland Regional Programme. In 1995, ICARDA phased out all its technical positions in Morocco and, consequently, in all the North Africa countries. However, the position of Regional Coordinator continued to be maintained at the NARP office in Tunisia.

Evolution of Partnership and Approach to Collaboration

NARP has evolved in the last 22 years through two main stages: evolution in the nature of partnership, and in the collaborative approach adopted.

The relationship progressed from simple collaborative

research activities covering germplasm exchange to a much more institutionalised country/ICARDA partnership and, eventually, a NARP/ICARDA partnership. Through the bilateral research programmes with Tunisia, mentioned earlier, the Institut National de la Recherche Agronomique de Tunisie (INRAT) established, for the first time, barley and food legume programmes. Cooperation with INRAT was extended to cover not only the Institut National Agronomique de Tunisie (INAT), but also the Office des Cereales of the Ministry of Agriculture, which covers technology transfer and extension activities. As a result of this collaboration, three new high-yielding barley varieties were released in 1985 for the Tunisian environment.

With the establishment of the Regional Office in Tunis in 1984, the relationship between ICARDA and the North African countries evolved to regionalise agricultural research. Initially, annual National Coordination Meetings involving Tunisian and ICARDA scientists were held to present and discuss the outcome of collaborative research in the previous year and develop work plans for the coming season. In 1987, a Regional Coordination Meeting was held, in which Algeria, Morocco and Tunisia participated. Libya joined later in 1989. The meetings first covered research on the improvement of cereals and food legumes, then on natural resource management. Regional activities also included travelling workshops, where multi-disciplinary scientists from all the North African countries jointly visited back-up research and on-farm activities in each country by rotation.

A number of cooperative networks were set up in the Maghreb countries for germplasm and information delivery. This cooperation included disease surveys, training and traveling workshops for farmers, extensionists and scientists. NARP was responsible in the late 1980s for executing a UNDP-supported project on cereal and food legume disease monitoring and germplasm enhancement in Algeria, Morocco and Tunisia, and also a technology transfer project supported by the Italian Government and IFAD. This latter project was aimed at increasing barley, food legumes and livestock production in North Africa.

In accordance with a CGIAR directive to devolve faba bean improvement to NARS in North Africa, all breeding material, research supplies, laboratory facilities and field equipment were handed over in 1992 to Morocco's Institut National de la Recherche Agronomique (INRA). However, based on the recommendations of the Third External Program and Management Review in 1993, faba bean research was reinstated at ICARDA.

Around 1991, research on pasture, forage and livestock production gained importance in the area. Work focussed on seed production and crop rotations. In Algeria, links were forged with the Institut Technique des Grandes Cultures on crop/pasture rotation trials aimed at integrating small ruminants into farming systems.

In the mid-1990s, collaboration was stepped up on cereal breeding in North Africa. Collaboration with Morocco particularly emphasised the development of wheat cultivars resistant to Hessian fly. Work on dryland natural resource management in North Africa also got a boost in 1995 when NARP joined the West Asia Regional Programme (WARP) in the Mashreq and Maghreb project, jointly funded by IFAD and AFESD.

At the end of the 1990s, a collaborative programme was developed with Mauritania for rehabilitation of research stations, crop improvement, on-farm water management and range/livestock systems.

Achievements

Collaborative research in all four countries meant that there was a steady flow of improved varieties of such crops as barley, bread and durum wheats, chickpea and lentils for release through the programme (see Table 1 on page 53). Work on Hessian fly resistance resulted in the release of cultivars resistant to this insect pest in Morocco. The Moroccan farmers were also among the first to take part in a large-scale adoption of winter sowing of chickpea with substantial gains in productivity. In Tunisia, 50-84% higher yields were obtained in demonstration trials that made use of the same technology.

Faba bean research, which was moved from ICARDA headquarters to Morocco in 1989, made significant progress, particularly in identifying selections with good resistance to the parasitic weed *Orobanche*, the most serious constraint to production of this crop in North Africa.

The Mashreq and Maghreb regional adaptive research project for the "Development of Integrated Crop/Livestock Production in the Low Rainfall Areas of WANA," aimed to increase the productivity of barley, forages, rangelands and small ruminants in the rainfed semi-arid areas. The project also undertook policy and institutional research, including analysis of the impact and role of government policies, property rights and local institutions on resource management and crop and livestock production in the low-rainfall areas of WANA, and made significant impact. Examples of successful technology transfer activities included the use of feed blocks—made from agricultural by-products and spineless cactus as a feed source for livestock. Regular exchange of visits and travelling workshops allowed farmers and researchers to interact.

Highland Regional Programme

Background

About 40% of the arable land in WANA is highland—over 750 m above sea level. These areas, which have poor access to markets, are characterised by cold winters and marginal lands with low fertility and high vulnerability to erosion. NARS have always tended to devote fewer of their resources to these areas, as the gains in productivity are lower. The same is true of international donors.

ICARDA recognised the need to address the problems of highland agriculture and therefore decided to locate one of its three sub-centres near Tabriz in Iran in 1977. However, the political events in Iran in 1978 led to the abandonment of this site, although collaboration with the national programme of Iran continued. This, however, necessitated moving the coordination of highland research elsewhere. Efforts were made

to find a suitable host country and a donor willing to fund a substantial project. These twin issues were provisionally resolved by choosing Pakistan, which has more than 40 million hectares of highlands, principally in Balochistan, the North West Frontier Province and the Northern Areas. USAID was identified as a potential donor, and the Federal Pakistan Agricultural Research Council's (PARC) Arid Zone Research Institute (AZRI) at Quetta in Balochistan as the research partner. Following negotiations with USAID, a five-year contract was signed with ICARDA in 1985, providing for four resident expatriate staff members and a budget of US$4.5 million. The initial thrust was on institution building, although crop improvement, range management and small ruminant production research was also carried out.

A second phase of the project (up to 1994) permitted consolidation of institutional development work and further research to solve the agricultural problems of highland dry areas.

Important collaborative work was done in Pakistan from 1986 to 1994, but in 1990, the coordination base for the Highland Regional Programme (HRP) was transferred to Ankara, Turkey. HRP serves the highland areas of West Asia (Turkey, Iran, Afghanistan and Pakistan) and North Africa (Algeria, Morocco and Tunisia), and initially also supported the activities of the newly independent republics of Central Asia and the Caucasus, which have agroecologies similar to those of the highland areas in West Asia.

Indeed, from the beginning, ICARDA also had a strong collaboration with Turkey in the field of evaluation of cereal and food legume germplasm in the Turkish highlands. In 1991, the first screening of lentil and chickpea germplasm for cold tolerance was started in Turkey in collaboration with the Central Agricultural Research Institute.

Collaboration with NARS

Like ICARDA's other regional programmes, HRP follows a collaborative research approach; thus fostering research in partnership with national programmes. Together they iden-

tify new research needs and opportunities, and research efforts are often decentralised to the research sites of the NARS. An example is crop improvement, where ICARDA supplies improved germplasm to the highland NARS. This germplasm takes account of different production constraints, and is developed with local needs in mind. NARS and ICARDA researchers do the evaluation and selection of germplasm at highland sites jointly.

The approach also involves setting up inter- and intra-country research networks for exchanging information and germplasm. Formal links are now established between Pakistan, Iran, Afghanistan and Turkey; Turkey and North African countries; and the republics of Central Asia. Informal networks have been created for sharing improved germplasm, information on cereal-rust outbreaks and virulence and scientific information through study visits, training courses and travelling workshops.

Because of the agroclimatic diversity, ICARDA adopted the strategy of formulating bilateral projects in partnership with NARS to generate production technologies suitable for each region. A brief description of some key projects follows.

Achievements

Turkey/ICARDA Highland Project: This special project, financed by the Italian Government, was established in Ankara in 1990. Initially comprising seven sub-projects on barley, food legumes (chickpea and lentil), feed legumes (vetch and grasspea), socioeconomics, rhizobiology, sainfoin productivity improvement and development of farming systems for small-scale farmers of the Taurus Mountains, the project expanded to have 15 small sub-projects. The principal objective was to develop improved crop germplasm and technology for the highlands of Turkey and other countries of WANA.

Several improved crop varieties were identified and subsequently released for use by farmers in Turkey. The improved germplasm was shared with other highland countries of WANA and Central Asia. Through the work of the Taurus Mountains sub-project, it has been possible to demon-

strate that increased production, productivity and income generation are possible for small-scale and resource-poor farmers. Multi-disciplinary and multi-institutional collaboration have been strengthened, and a great deal of technical information and experience transferred, resulting in institutional strengthening.

International Winter/Facultative Wheat Improvement Project: With its sister centre, CIMMYT, ICARDA has provided support in Turkey for the improvement of winter wheat for WANA countries and is an active partner in the Turkey/CIMMYT/ICARDA International Winter Wheat Improvement Programme, based in Turkey.

Iran/ICARDA Special Research Project: Although the earlier plan to establish a sub-centre at Tabriz was frustrated by political events, ICARDA never stopped working with Iran. A regular supply of improved germplasm on wheat, barley, chickpea, lentil and vetches continued. In 1991, the Iran/ICARDA Special Research Project, funded by the Government of Iran, was initiated. This project is implemented in collaboration with the Dryland Agricultural Research Institute in Maragheh near Tabriz, and its sub-stations across the country, funded by the Iranian Government, and serves as a focal point for dry-area agricultural research in the country. It encourages collaborative research, transfer of technology and institutional strengthening. Several hundred Iranian researchers have been trained through short- and long-term courses since 1984, and in recent years, nearly 40 Iranians were sent abroad for PhD studies.

EU/ICARDA Mediterranean Highlands Project: HRP established a network for the Mediterranean highlands linking those of Turkey with the highland areas of North Africa, and promoting exchange of germplasm, technology and information. This was made possible through the EU-supported EU/ICARDA Mediterranean Highlands Project, which started in the 1994/95 cropping season.

Central Asia: Until the establishment of a separate Central

Asia and the Caucasus (CAC) Regional Programme in 1998, the HRP was largely responsible for collaborative activities in the CAC region. The first major ICARDA efforts started there in 1995 when a workshop was organised in collaboration with the German Agency for Technical Cooperation (GTZ/BMZ) and the Uzbekistan Academy of Agricultural Sciences. The purpose was to assess the needs for agricultural research and seed production in the newly independent republics of Central Asia and Transcaucasia. Since then, cooperation has covered a wide range of research on germplasm, crop breeding, range management, livestock and biodiversity. It also involves building links between Central Asian scientists and colleagues elsewhere. Two examples of this occurred during the first two years of intensive cooperation in 1996 and 1997. These were in biodiversity conservation, in collaboration with ICARDA's sister centre, the International Plant Genetic Resources Institute (IPGRI), and in reversing rangeland degradation in collaboration with the Small Ruminant Cooperative Research Support Programme (SR-CRSP) of USAID and the United States Department of Agriculture (USDA).

West Asia Regional Programme

Background

The West Asia Regional Programme (WARP) was established in July 1989 in Amman, Jordan, to coordinate research and training activities, and develop practical solutions to the problems of rainfed agriculture in Cyprus, Iraq, Jordan, Lebanon, Syria and lowland Turkey. It focuses primarily on the region's major staple food—wheat, barley, lentil and chickpea—and feed crops, such as forage barley and pasture legumes, and on small-ruminant nutrition and management, with emphasis on crop-livestock integration.

Cooperation with NARS

WARP seeks to promote regional cooperation in research, training and information dissemination and to enlist full

involvement of national programmes in ICARDA's research agenda. With ICARDA's greater emphasis on upstream research at its headquarters, applied and adaptive research has been increasingly decentralized. Instead of building a large outreach staff, ICARDA relies on national scientists for that research by linking them within networks supported by the Centre and helping them to get access to resources through special funding. The Mashreq Project, which operated from 1989 to 1994 through funding from UNDP and AFESD, and its subsequent transformation—the Mashreq and Maghreb Project—funded by IFAD and AFESD, are good examples of this approach.

Achievements

Germplasm Enhancement: A particular area of cooperation between ICARDA and NARS in West Asia is germplasm enhancement and breeding. ICARDA provides the germplasm to national programmes upon request. By the end of 2001, national programmes had released a large number of cultivars of the different crops from germplasm originating from ICARDA material (see Table 1 on page 53).

The Mashreq Project: The Mashreq Project was a regional project aimed at improving the production of rainfed barley, forages and sheep in Syria, Iraq and Jordan, in zones with an average annual rainfall of 200-350 mm. It promoted effective collaboration among national research and extension institutions in the countries involved, for transfer of available technologies to farmers, and established a regional research network involving ICARDA and national programmes. Promising varieties of barley adopted for dry areas were identified. Practices for improved management of small ruminants were tested and promoted.

The Mashreq-Maghreb Project: This regional adaptive research project entitled "Development of Integrated Crop/Livestock Production in Low Rainfall Areas of WANA", started in 1995, in partnership with the national

programmes of eight countries (Algeria, Iraq, Jordan, Lebanon, Libya, Morocco, Syria and Tunisia) and the International Food Policy Research Institute (IFPRI). The results of the Mashreq Project provided a base for this initiative. The project aimed at increasing the productivity of barley, forages and other feed crops, rangelands and small ruminants in the rainfed semi-arid areas and undertook policy and institutional research, including analysis of the impact and role of government policies, property rights and local institutions on resource management and crop and livestock production. Its first phase ended in 1998. The second phase, which involved greater community participation in problem identification and solution development, ends in 2002. The project has benefitted the local communities by improving their livelihoods and helping them with sustainable management of their resources.

Human Resource Development

WARP enhanced regional cooperation between countries in many ways, including regional training, seminars, workshops, study tours and annual Coordination Meetings. Cyprus, for example, hosted a training course on hay production techniques, during which Cypriot scientists instructed trainees from Jordan, Syria and Iraq. Similarly, scientists from Iraq and Turkey shared their expertise in sheep reproduction.

Through the Mashreq-Maghreb Project, cooperation with NARS was further strengthened by establishing good linkages with farmers and extensionists.

Latin America Regional Programme

Background

Barley and faba bean, for which ICARDA has a global mandate, are important crops in several countries in Latin America. The Latin America Regional Programme (LARP) works primarily to serve the needs of rural communities for

these commodities, with major emphasis on food barley for the Andes. These areas require a different type of barley germplasm, which LARP has been developing in cooperation with national partners and advanced research institutes. Recently, the focus of the programme has shifted to include the role of barley and other crops in the predominantly potato-based systems of the upland areas.

LARP was established in 1984 at CIMMYT, Mexico. It was coordinated until 1998 by a ICARDA/CIMMYT barley breeder. In recognition of the importance of barley and faba bean in the potato- and livestock-based farming systems, LARP activities were further diversified and the LARP Coordinator's office moved to Lima, hosted by the International Potato Center (CIP). An agricultural economist from ICARDA's headquarters staff moved to Peru to become the Regional Coordinator of LARP in February 1999, while the barley improvement work continues at CIMMYT, Mexico through the joint ICARDA/CIMMYT Barley Project, with a barley breeder posted there.

Evolution

Diseases pose the main constraint to barley production in Latin America, of which stripe rust (*Puccinia striiformis*) has been particularly devastating for the traditional barley crops in Columbia, Ecuador, Peru, Bolivia and Chile. The ICARDA/CIMMYT barley programme has provided stripe-rust-resistant barley germplasm to all affected national programmes. A number of stripe-rust-resistant varieties have been released by the national programmes of Ecuador (3), Peru (5), Bolivia (3) and Chile (2).

To provide better stability and durability to the new varieties, multiple disease resistance was introduced. Incorporation of disease resistance began in 1982 and continues. While the programme started with breeding barley resistant to both stripe and leaf rust (*Puccinia hordei*), subsequent work added yet more disease resistance in a step-by-step approach. In 1997, cultivars resistant to six or more diseases were made available to the national programmes.

Cooperative Relations and Achievements

Having a common interest in the problem of stripe rust resulted in close cooperation between Oregon State University and the ICARDA/CIMMYT programme. A network between them and Ecuador was established to map stripe-resistant genes in Ecuadorian varieties using molecular techniques (AFLP, RLP). Identification of genes responsible for resistance to yellow rust resulted in the release of the varieties 'Calicuchima' and 'Shyri.'

In 1993, an epidemic of head scab in the Americas caused serious losses in wheat and barley. Breeding for resistance to head scab, caused by *Fusarium* spp., continues to be an important activity of LARP. China and Ecuador have released scab-resistant varieties to their farmers. A network for developing head scab resistant barley was formed involving the universities of Oregon State and North Dakota State; Argentina, Brazil, Bolivia, Chile, China, Ecuador, Peru, Uruguay, and the LARP barley programme.

Hull-less barley is considered a novel crop in the Americas. Chile and Brazil have released hull-less varieties from the collaborative work with the LARP barley programme.

The LARP barley programme has implemented a project in Ecuador to promote adoption of modern high-yielding barley varieties through farmers' seed production activities. Some 240 farmers grew barley on 100 ha scattered in four villages in 1997 in this project and participated in farmers' field days. LARP has also provided training opportunities for young researchers in the improvement of barley, faba bean, lentil and kabuli chickpeas.

Arabian Peninsula Regional Programme

Background

This programme serves the countries of the Gulf Cooperation Council (GCC)—(Bahrain, Kuwait, Qatar, Saudi Arabia, the Sultanate of Oman and the United Arab Emirates)—and the

Republic of Yemen. It started in 1988 as a research and training programme entitled "Strengthening Barley and Wheat Research and Training in the Arabian Peninsula." A full-time Regional Coordinator was appointed in 1996 and the Regional Office established in 1997 in Dubai, hosted by the United Arab Emirates (UAE). Two senior scientists (a water management specialist and a protected agriculture specialist) were posted to the Dubai Office. In 2001, a range/forage specialist was also appointed.

The programme has been responsible for the collection and conservation of range-based resources, improvement of important food crops, rehabilitation of heavily degraded rangelands, research support to protected agriculture and screening different forages and shrubs for salinity tolerance. Funding for APRP Phase 1 (1997-1999) activities was provided by the Arab Fund for Economic and Social Development (AFESD) and the International Fund for Agricultural Development (IFAD).

Achievements

The major achievements of Phase I included providing countries of the region with more than 700 sets of international and regional cereal, legume and forage nurseries, developed to meet the specific needs of each country, for evaluation under prevailing biotic and abiotic stresses. Testing and evaluation of this germplasm resulted in the release of several improved cultivars of barley, bread wheat, durum wheat and chickpea in Qatar, Saudi Arabia, Sultanate of Oman, United Arab Emirates and Yemen.

More than 300 national scientists from the Arabian Peninsula participated in various long-term, specialised and individual training courses organised at ICARDA headquarters in Aleppo, Syria. Several consultancy missions were also sent to the participating GCC countries.

After the 1990/91 Gulf crisis, the lost genetic resources of wheat, barley, chickpea, lentil and faba bean in Kuwait were replenished by ICARDA.

In 1995, the partners in the programme decided to consolidate its progress and achievements by embarking on a

second phase entitled "Strengthening Agricultural Research and Human Resource Development in the Arabian Peninsula." It continued to concentrate on rangelands, shrubs, irrigated forages and livestock; protected agriculture; abiotic stresses; and on-farm water use and irrigation management. Additionally, work on the commodity crops of ICARDA aimed at increasing food security, optimisation of water-use efficiency, conservation of natural vegetation, prevention of soil degradation and desertification in the Arabian Peninsula. Strengthening of cooperation among participating countries and with regional and international organisations continues. The project, co-funded by AFESD, IFAD and OPEC was implemented in 1997.

Central Asia and the Caucasus Regional Programme

Background

ICARDA collaborated with the Soviet Academy of Agricultural Sciences on dryland agriculture before the dissolution of the Soviet Union. Afterwards, collaboration continued with several republics in Central Asia (Kazakstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan) and the Caucasus (Armenia, Azerbaijan and Georgia) and was consolidated under a separate Central Asia and the Caucasus Regional Programme (CACRP). The programme was based in Tashkent and a Regional Coordinator appointed. A cereal breeder was also appointed to support the work there. CACRP has also hosted the Programme Facilitation Unit (PFU) of the CGIAR since 1999 in Tashkent.

ICARDA's major involvement with the NARS of CAC began in 1995 when the Centre took the initiative in organising a workshop to identify the agricultural research and seed production needs of Central Asia and the Caucasus in Tashkent in collaboration with the Uzbekistan Academy of Agricultural Sciences, CIMMYT, IPGRI, ISNAR and the German Ministry of Technical Cooperation. Further initiatives from ICARDA for the CAC region continued in 1996 through its Highland Regional Programme, based in Ankara, Turkey. Exchange of germplasm, information and scientific

visits increased. Scientists from CAC were supported to attend regional and international conferences and training activities.

Achievements

Two promising varieties of winter wheat and one each of winter barley, spring barley, chickpea and lentil have already been released in the region based on their superior performance. These varieties have consistently produced 30 - 40 % higher yield and have better cold tolerance and disease resistance than the local checks. In addition, more than 25 varieties of different crops are being tested in the State Varietal Trials.

In southern Kazakstan, alternative furrow irrigation, which did not require additional investment, saved irrigation water by 30% and reduced pressure on the drainage system by 40%. In Uzbekistan, portable polyethylene chutes used for distribution of irrigation water in furrows at the sloping area contributed to significant decrease in surface runoff and up to two times increase in water productivity compared to traditional techniques. On sloping lands of the Faizabad site, Tajikistan, positive results were obtained from terracing and mulching as well as from growing food grain crops between the rows of fruit trees and grapes under rainfed conditions.

Studies on conservation tillage showed that minimum tillage or zero tillage practices are beneficial. Chickpea and lentil are promising legume crops for diversification of largely wheat-based cropping systems in practice, especially in northern Kazakstan. Sorghum, sudan grass, sunflower, poplar and willow saplings, being salt tolerant, are suitable for irrigating with treated wastewater.

Among alternative fodder sources, sainfoin, atriplex, suaeda, holoxyon and salsola proved to be promising. Also, mulberry leaves could be an attractive unconventional feed in Uzbekistan. Early weaning and early lambing has increased income of livestock farmers. Sarajin and Karakul sheep, which were never used for milking in the past, are

now used for milk production, generating extra income for livestock farmers.

In view of rich genetic wealth of crops, fruits and vegetables, besides small ruminants, considerable emphasis has been laid on strengthening genetic resources conservation. A Central Asia and Trans-Caucasian Network has been established involving all eight countries. Gene bank of Uzbekistan is being strengthened and more than 1400 valuable collections of cereals and legumes have been made. Capability for germplasm evaluation and documentation has been enhanced and valuable livestock genetic resources are being characterized.

The NARS have been supported effectively in institutional and human resource capacity building. More than 40 short and long-term training courses, 16 study visits, 44 regional/national workshops, involving around 2440 scientists were organized, in addition to English language courses for more than 200 scientists in the region. Also, around 228 scientists from the region were supported to participate in 12 international conferences.

8
Governance, Finance and Buildings

Board of Trustees

Like all the CGIAR Centres, ICARDA is an independent, autonomous institution, governed by a Board of Trustees (BOT) vested with the responsibility to the donors as well as to the Centre's stakeholders. The Board's responsibility is to ensure that the needs specified in ICARDA's Charter are adequately pursued and that the 'mandate' is suitably translated into action. This is done in a cost-effective way so that the financial resources made available by the donors are used judiciously for the public service at large.

The element of autonomy is balanced by the other components of the workings of the CGIAR wherein the centre(s) do not work in isolation, but as part of the whole CGIAR system. Technically and scientifically, the programmes of ICARDA are under close surveillance by TAC annually on the one hand, and by 'Panel Reviews' undertaken every five years. A list of ICARDA Board members since its inception to date is presented in Appendix 5.

The financial health of ICARDA is also carefully and regularly reviewed; first by an independent auditor who annually reports to the Board, and second, by the built-in mechanism of an annual financial reporting to review by the CGIAR system.

Appointment of the Board of Trustees

The Board of Trustees shall consist of not more than eighteen Trustees appointed by the Board as follows:

(a) Up to two Trustees nominated by the Government hosting the headquarters and one Trustee by each Government where a principal station of ICARDA is situated;
(b) Three Trustees nominated by the Consultative Group in consultation with the Board;
(c) The Director General of the Centre as an Ex-officio Member of the Board;
(d) The remaining Trustees selected by the Board.

Terms of Appointment

All Trustees other than the Director General shall be appointed for a period of three years. The tenure should not exceed two terms, except for host country nominees. Where it is thought to be necessary, a Member retiring after his second term can be appointed as a consultant to the Board, or can be newly elected after a lapse of one or more years. A list of Trustees since ICARDA's inception to date is presented in Appendix 6.

When the office of a Trustee nominated by a host government or the CGIAR becomes vacant during the term of the Trustee appointed thereto because of retirement, death, incapacity or any other cause, the party that originally nominated the Trustee to that office may nominate a person for the remainder of the term or for a further term.

All Trustees, other than the Director General, shall be appointed for a term of three years starting immediately upon their election. The Membership of the Board terminates at the close of an ordinary BOT meeting.

Powers of the Board

The Board of Trustees shall:

(a) Define operational goals for the Centre;

(b) Determine policies for the operation of the Centre;
(c) Monitor the implementation of the policies;
(d) Elect a Chairperson and Vice-Chairperson from among its membership;
(e) Appoint the Director General of the Centre for such period or periods it considers appropriate;
(f) Appoint, on the recommendation of the Director General, the Assistant Directors General, the Director of Administration and Finance, the Director of International Cooperation, the Secretary of the Board and the Treasurer.
(g) On the recommendation of the Director General, fix the range of salaries and the terms and conditions of employment of ICARDA staff;
(h) Establish and adopt by-laws and rules of procedures for the conduct of its meetings and for the general governance of the Centre;
(i) Approve the Centre's annual program of work developed by the Director General;
(j) Consistent with the budgetary and accounting guidelines established by the Consultative Group, establish and adopt the general guidelines for the preparation of regular budgetary estimates and for the regulation of the financial affairs of the Centre;
(k) Scrutinize and approve the annual budget estimates for the Centre;
(l) Appoint independent External Auditors of recognized international competence to conduct the annual audits of the Centre's activities;
(m) Establish limits for the total aggregate borrowing on behalf of the Centre in any given year; and
(n) Publish, within a reasonable time after the termination of each operational year, a report on the activities of the Centre for that year, including the financial statements of the Centre and the Auditor's report thereon.
(o) Resolve grievances forwarded by the Director General or Grievances Committee.

Standing Committees

In order to perform the functions assigned to it, the Board has formed the following Standing Committees:

- Executive Committee
- Program Committee
- Nominations Committee
- Audit Committee

Finance

When the first donors made their respective pledges setting ICARDA in motion, it was intended to headquarter the Centre in Beirut and establish three outreach stations: at Tabriz in Iran, Terbol (with Kfardan) in Lebanon, and Tel Hadya in Syria. Although this unique three-station arrangement appeared to be a bold defiance of the hard sociopolitical realities on the ground, it paled in significance when faced with the daunting reality of those complex constraints. In addition to the logistical difficulties encountered against a turbulent regional backdrop, there were the *raison d'être* demands exceeding the capacity of a centre that was still in its infancy.

Problems in Iran and troubles in Lebanon dashed the original hopes for the three-station concept. The prohibitive cost of developing and managing this cumbersome model was one of the major constraints which resulted in scrapping the original plan.

From 1977 to 1981 the headquarters was based in Beirut, Lebanon, with a senior management team comprising the Director General (Dr Harry S. Darling), Deputy Director General (Dr Mohamed A. Nour) and Financial Controller and Treasurer (Mr Ted Wightwick). Plans, budgets and administrative matters were discussed with the Station Director (Dr Owen L. Brough) and other management and resarch staff in Aleppo by telexes and making occasional visits.

Budget requests were sent from Aleppo to Beirut for consideration, and budget discussions were carried out by telex and in writing via the weekly mail between the two loca-

tions. Budget finalisation was time-consuming and was formulated away from where the bulk of work was being done. This required extensive communication, correspondence and staff time.

The monthly financial reports were prepared in Aleppo by the Station Financial Officer (Edward Sayegh) and sent to Beirut for consolidation and re-issuance by the Financial Controller and Treasurer. Queries on the monthly accounts were made by telex. The distance, the answering of queries, and the re-issuing of the financial reports took between three and four weeks to get back to the Station Director and Programme Leaders. By the time the re-issued financial reports were received in Aleppo they were already over a month late and almost obsolete!

Fund transfers were made from ICARDA's main bank account with the Hong Kong and Shanghai Banking Corporation (HSBC) in the U.K to the ICARDA account at the Commercial Bank of Syria (CBS) in Aleppo. Occasional hitches in the Aleppo banking system used to render transfers untraceable for weeks, leaving the Aleppo station operating on meagre resources.

The CBS supplied ICARDA with limited foreign currency for international travel and issued bank drafts in a limited number of foreign currencies. The exchange rates were official (fixed by the Central Bank in Damascus), and were initially slightly lower than the market rate outside Syria. The gap kept widening, eventually reaching approximately five times the official rate. Later, the Government allowed ICARDA to take advantage of what was called at that time the new "encouragement rate," which was approximately twice the official rate. The gap between the market rate and the new official rate was substantially wide enough to be of great concern to ICARDA's management.

Staffing the Finance Department was challenging in the early stages. As accounting records were kept in English, it was found more efficient to hire English-language graduates and train them in simple book keeping, which thus elevated their technical skills and efficiency.

End of the Beginning

By the turn of the 1980s, second-generation problems emerged, heightened in frequency and intensity by the seemingly endless turmoil in Lebanon. A rocket pierced the bedroom of the Director General's residence in Beirut, luckily in his absence. The (then) Deputy Director General was kidnapped at gunpoint in his Peugeot as he drove in Beirut, to be later set free in a deserted suburb. Since there was only a semblance of policing, there was no hope of retrieving the car. Likewise, several ICARDA drivers in Kfardan and Terbol were—under threat of arms—userped of their heavy-duty vehicles and tractors. In a less violent incident, two Lebanese 'gentlemen' came to see the Director General at ICARDA Beirut office to inform him—after the courtesies of Arab coffee hospitality—that they had taken over the Kfardan farm of ICARDA to sow potatoes and "some hashish"! A later attempt to inspect the site was politely refused at the farm gate by armed personnel who were definitely not in ICARDA's employ. They kept Kfardan to themselves for a whole year.

Life in Lebanon became increasingly hazardous. All airlines (other than the Lebanese national carrier) stopped serving Beirut, and even road transport to and from Syria became at times fraught with outright danger. The need for moving the Head Office from Beirut to Aleppo became increasingly clear and palpable as time went.

By 1981, all the professional expatriate staff were safely stationed in Aleppo. Tel Hadya became the *de facto* Principal Station. Three premises in Aleppo city were rented to house the various functions of ICARDA, including laboratories, training and documentation facilities, a printing press, as well as offices for administration and finance. Even a school for the children of staff was started in 1977 in a rented building (Appendix 6). Thus, Aleppo had also become the *de facto* city home of this Centre! Yet, the Director General's office tenaciously stuck with the Head Office in Beirut. Dr Harry S. Darling, the first Director General, remained in Lebanon throughout his tenure (1977-81), together with his Deputy and the Financial Controller.

However, the second Director General Nour, realised the Head Office could no longer remain remote from the Aleppo mainstream activities. Shortly after his appointment in July 1981, he moved his office into the Farm Manager's prefabricated premises at Tel Hadya. Aleppo also became his place of residence. The Financial Controller Ted Wightwick left soon after, and Edward Sayegh took over. Thus, 1981 was a watershed year in the early life of ICARDA when the growing pains of its dichotomy were at last gone.

Consolidation Phase

Events moved fast. In early 1982 consolidation at Aleppo/Tel Hadya meant fewer management layers and a leaner organisation where top and medium executives teamed closer together. Step-by-step progress brought increasing harmony to the process of directorate decision-making, which took a crisper turn as a result. The concentration of talent into one team produced a synergy and an optimum critical mass that greatly benefitted ICARDA.

Thus, the consolidation phase had a major impact on the strategic direction of ICARDA, and on the planning, budgeting, resource allocation, accounting and reporting processes. All these areas were examined and major efforts were made to re-engineer them based on the new vision, mission and strategy. Computerisation of the Financial Management system was a top priority, which coincided with the appointment of a Director of Computer Services.

Based on the new vision, mission and strategy, ICARDA radically transformed its programmes, staffing, organisation and management. The Centre's organisational structure had four major components:

1. Research Programmes
2. International Cooperation
3. Finance
4. Administration

The Board of Trustees, through the Program, Finance and Executive Committees, provided policy direction and review of activities, and monitored the overall performance of the Centre.

Reorganisation of the Finance Functions

With the consolidation phase, it was necessary to reorganise the Finance Department to provide client-oriented and responsive support services. The goal was redefined and the Department's culture was changed from a policing and sometimes rigid function to client-oriented approach. Special attention was given to the relationship between scientific research personnel and administrative functions. It was easy to lose sight of the perspective that research was the prime *raison d'être* of ICARDA and that the function of the administrative structure—in particular the Finance Department—was to support the research functions. The more fruitful approach to the relationship, which was introduced at ICARDA, was to consider the total activity of the Centre as a team effort. All endeavours were construed as support to research, to forwarding definable objectives. In this context, the reorganisation that was implemented meant financial and management information and services were properly seen as management tools, to be used effectively by scientific research in cooperation with the administrative team members.

These objectives influenced the development and implementation of the reorganisation of the Finance Department. Finance functions were reorganised into six units each headed by a Finance Officer: Planning and Budgeting; Financial Accounting; Cost Accounting; Outreach and Regional Accounting; Financial Reporting; and Cash Management. Finance Officers reported directly to the Financial Controller and Treasurer. They were recruited both locally and internationally, and placed on a salary scale specially designed for this calibre of scientific and administrative officers. The package was competitive enough to attract the required young and dynamic professionals.

A lean staff was retained in Beirut, Lebanon, to handle the accounting, banking, purchasing, and liaison functions. These accounting functions reported to the Financial Controller and Treasurer.

Planning

Strategic planning was streamlined through a continuing and cyclic process involving management, staff and, regularly, the NARS. The results were fed annually into the Technical Advisory Committee (TAC) of the CGIAR. Foremost in ICARDA's objectives were (a) transparency and (b) relevance of research/training to the needs of the region and beyond. The principal inputs came from the feedback of the NARS, the surveillance of TAC and, of course, from the individual and collective brainpower of a highly experienced and qualified staff. The main parameters of planning that guided the cyclic process of consultation (i.e. top/bottom/top) were:

- Assessing relevance of current and medium-term research/training activities against the respective needs of the national, regional and global clientele.
- Balancing those generic and specific needs against the current and extrapolated science and technology available to ICARDA through its built-in capabilities, and at the same time accessible to it in other, more upstream institutions.
- Allocating financial resources proportionately to the *research/training programmes* based on the parameters above.
- Evaluating the output on a regular and extensive basis, with any final decisions resting with the collective leadership of ICARDA. Such outcomes feed back to the beginning of the planning process and are a good indicator of the capacity, quality and credibility of management at the top.

Budgeting and Resource Allocation

In 1982, ICARDA adopted the project management system for the first time. Allocation of time by each senior staff member into the projects within each Programme is done in concert with the Programme Leader who reviews the time allocation within the bounds of the assigned budget resource. The Directorate then ensured, within reasonable bounds, the balance among the Programmes, and the Board of Trustees

reviewed and approved a budget through its Programme and Executive Committees. The CGIAR, through the TAC, allocated the funding resource.

Exchange Rate Dilemma

Perhaps of all the teething troubles ICARDA management endured in the first decade of its development (1975-85), the currency dilemma was the most excruciating one. From the outset, the management at Aleppo was bound by the Syrian exchange rate to the US dollar, structured into two layers that included the market (forbidden) rate. While the official rate was fixed at 3.4 Syrian Lira (SL) to the dollar, the other rate continually rose. To start with, it was SL 12, but the gap widened to reach SL 30 in later years. Sometime in the late 1970s, the Government introduced a mid-tier rate (at approximately half the market rate value) and called it the Encouragement Rate of Exchange. ICARDA was allowed to change its dollars mostly—though not exclusively—on that level of conversion.

Seeing that valuable dollars attracted a low exchange rate in Syria, and as ICARDA was fully covered legally to exchange its dollars outside Syria, it adopted a new system to convert its dollars into Syrian currency in Lebanon. This became famously known as the "Lebanese Window!"

The official exchange rate was of growing concern to ICARDA's management. The greatly suppressed exchange rate at Aleppo rapidly eroded the purchasing power of ICARDA's budget. To remedy the situation and ensure value for the money exchanged, ICARDA explored various alternatives supported by solid legal advice. For the building program, research supplies and spare parts, ICARDA took advantage of duty-free and tax-free privileges and imported most of its requirements directly from abroad. It expanded its storage facilities to accommodate the large quantities ordered, and strengthened its materials management function. Payments to overseas suppliers were made by letters of credit or as Cash against Documents through HSBC in London. To speed up payments, a test key coding system was

provided by HSBC, which was used for all letters of credit and fund transfers.

The Lebanese Window option was used to exchange funds at a substantially higher market exchange rate and bring them to Aleppo. This was done mainly to cover the payroll of the nationally-recruited staff whose salaries were drastically eroded by the widening gap between the official and market exchange rates. The exchange gain on these transactions was substantial thereby increasing ICARDA's financial buoyancy. Although totally legal, the process generated a great deal of interest and some controversy at the System level. ICARDA pursued the money exchange in Lebanon to get the most from scarce resources and to maintain the purchasing power of its budget.

With hindsight, the Lebanese Window was a blissful windfall. It enabled ICARDA to maximise its revenue. Permanent asphalt roads were built criss-crossing 60 kilometres of the farm site, essential buildings costing in excess of budget limitations because of inflation were nevertheless erected, acutely-needed farm and office equipment was purchased, and staff salaries in Syrian lira were comfortably covered, together with their yearly incremental increases.

Later criticism might have toned down subsequent performance, but even today the great idea of a Lebanese Window is still operational. At that time, when ICARDA was coming under fire for this venture, the promulgation of such criticism could only serve to distract. Nevertheless, ICARDA emerged all the stronger and certainly better developed as a truly international institute. The buildings of ICARDA stand now as a witness to the validation of this wise and far-sighted legal use of resources.

The Buildings at Tel Hadya

A two-pronged strategy was used for the utilisation of the Tel Hadya site. In Phase I temporary prefabricated buildings were erected quickly to meet the mid-term needs for research/training and farm operations; they were to be dismantled if and when the permanent premises were built.

Brian Tierney, an experienced Australian construction manager, who had done a similar job with the International Rice Research Institute (IRRI) in the Philippines, was appointed in 1978. In very little time, Phase I was completed through the importation and assembly of semi-furnished prefabricated structures. Apt is the saying, however, that "nothing is more permanent than a temporary solution!" These buildings continued to serve for almost a decade before the permanent constructions were completed and became operational. Indeed, the prefabricated buildings are still fully functional today and will continue to serve the Centre's needs for decades to come.

Breakdown of Phase I costs

	US$ (m)
Seedstorage/offices/quarry excavation	1.695
Machinery repair workshop/offices	0.982
Warehouse/offices	0.465
Total	**3.142**

A Good Deed Never Ends

Phase II, on the other hand, was little more than a dream while funding for this purpose was not forthcoming from the traditional donors. Two important events enabled the permanent facilities to become concrete reality in the face of great odds. One was the breakthrough in the fund-raising exercise when Dr Ibrahim Shihata, then President of OPEC Fund for International Development, became convinced that ICARDA was a promising new venture into the realm of science in the WANA region that would grow into a centre of excellence and remain so, if properly nurtured. That was in 1980. He made the first breakthrough by declaring OPEC's support to finance, in part, the permanent building scheme of ICARDA. We owe him a debt of immense gratitude.

Not only did he lead OPEC to pledge more than half the amount initially sought for financing the permanent buildings (US$3.765m) but, as Executive Director in the Council of

Governors of the International Fund for Agricultural Development (IFAD), he successfully lobbied, and obtained approval for the first (and probably last) time from IFAD to finance the remaining US$3.5m of the buildings' estimated costs. Dr Shihata was supported in his drive by the then President of IFAD, Mr Adel Mohsen El Sodeiry. Thus, the plan for the permanent buildings Phase II was at last pulled from the drawing board, and advertised internationally for contractors to make their bids.

On ICARDA's 20th anniversary, Dr Ibrahim Shihata,* who had, by then, become a Senior Vice President of the World Bank, wrote to ICARDA Director General, Dr Adel El-Beltagy, to say:

"I strongly believe in the mission of ICARDA and in its potential contribution to the development of the region which is mostly a dry region. I have always believed that the region stands to benefit more from ICARDA's applied research and should spend more on agricultural research and extension. It is for these reasons that I did provide strong support to ICARDA in its initial years through my previous positions as Director General of the OPEC Fund and Executive Director of IFAD. More important perhaps than the grants I succeeded to ensure from these two institutions was the listing of ICARDA's activities on the agenda of the meetings of the Arab/OPEC aid institutions, and introducing its Director General at that time to the heads of these institutions. I am glad that these contributions have helped ICARDA in its formative years and I am gratified that you are recognising them by inviting me to attend the 20th Anniversary."

The second event of note was when the contracts submitted by various contenders from all over the world were opened and checked. The only company from Syria that applied was Milihouse (a public enterprise), and its overall bid was significantly the lowest. Therefore, the contract was signed with Milihouse. Under the high standards of supervision from Giffels Architects, a Canadian consulting firm, the permanent buildings we see today were successfully com-

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* Sadly, Dr Ibrahim Shihata did not live to see ICARDA's 25th anniversary. He passed away on 28 May 2001.

pleted. Had it not been for the low dollar value of the bid from Milihouse, augmented constantly by the Lebanese Window facility, the circumscribed buildings budget of ICARDA would not have stretched as it did to complete the whole of Phase II at Tel Hadya.

The logistics of this massive operation carried out at Tel Hadya would justify a full chapter on its own if justice was to be given to all those who actively participated. Suffice to say a team of three key stakeholders (Giffels Architects, Milihouse and ICARDA) was set up to oversee the operation from start to finish. An ICARDA buildings committee, chaired by the Director General, had charted the course and monitored progress.

Construction started in 1982. Despite the expected delays, all the units were handed over to ICARDA and became functional and occupied in 1986. They were:

Training, Communication and Conferences Building: US$3.5m
This two-storey building offers working facilities for training, communication and computer services, finance, library and executive management. All this was designed on the "open space concept" and furnished accordingly by Knoll International.

Research Laboratories: US$3.8m
They comprise two blocks, which include 52 laboratory modules readily adjustable to changing research needs. They include 80 offices. Dr Phil Williams, a senior level Canadian consultant, selected the internal laboratory fitments, organised allocation of space to users and chose the furniture to a uniform standard.

Genetic Resources Unit: US$1.2m
The Italian Government under the overall supervision of Alessandro Branch and Engineer Giocomo Scaraccia solely financed this facility. The financial request was advanced early in the 1980s; construction started in 1986, and the building was occupied in 1989.

In concluding this section, it would be wildly remiss not to draw attention again to the traditional donors whose annual flow of dollar contributions helped significantly in moving this massive building endeavour from wishful thinking to an outstandingly beautiful reality in Aleppian traditional cream-coloured stone, and a most functional facility as well.

The Donors

In the first chapter (the CGIAR), specific mention was made, starting with the Bellagio Conference I, on how the donors launched the System of International Agricultural Research into operation and growth, through their initial and continuing voluntary contributions. This section endeavours to state briefly the financial support that ICARDA received at its initiation and throughout its 25 years of active existence.

Figure 1 shows the annual budget allocations of ICARDA from 1977 to 2001.

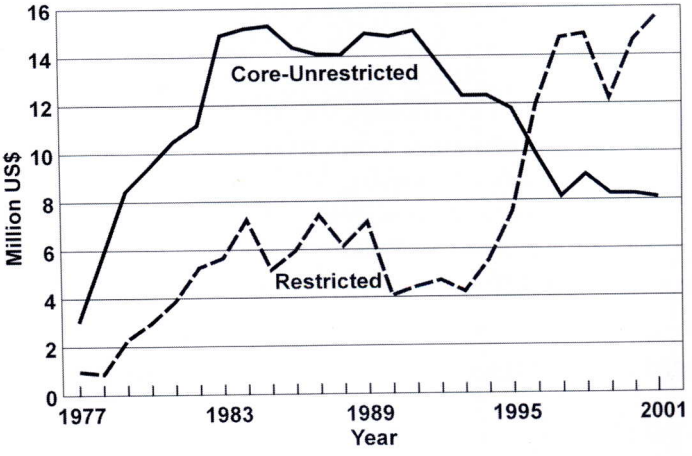


Fig. 1. ICARDA donor funding 1977-2001

There were no financial strings attached to the core budget for ICARDA into which the donors had made their respective contributions. This was the *modus operandus* of the CGIAR in the early years (1972-1977) when the collective inflow from donors rose by over US$50m, an average annual

increase of 30%. Concurrently, the number of donors joining the CGIAR system increased. As the number of centres increased, and as the spending appetite of each centre increased too, resources could not meet these escalating demands. To resolve this, the CGIAR entrusted TAC more and more with a watchdog role of balancing competing demands over limited resources against the scientific and technical priorities amongst the centres, and even between research/training programmes within each respective centre.

In this exacting financial atmosphere two trends emerged; one within the donors themselves, and the other amongst the centres. Some donors, other than the World Bank and USAID, decreased their core commitment to augment their restricted core pledges directed to specific programme thrusts e.g. rice, food legumes, etc. within one centre or more. The other trend was for the respective Centre Directors, in the face of this exacting atmosphere, to assume an advocacy role *vis-à-vis* the 'traditional' donors plus seeking resources (restricted or otherwise) from newer donors.

From birth, ICARDA felt this austere scenario setting in. As mentioned earlier, the pinch was felt most acutely in its capital (permanent building) allocations—they were virtually non-existent. Nevertheless, the traditional donors helped ICARDA live its formative years in relative affluence, as can now be seen from the following 1997 announcement.

In ICARDA's weekly newsletter, *The Week at ICARDA*, on 24 April 1997, Dr Adel El-Beltagy, present Director General of the Centre, had this to say to his staff on the 1997 budget:

DG calls for cuts in spending, not research

Addressing ICARDA's senior staff on Tuesday, 15 April, the Director General, Prof. Dr Adel El-Beltagy, outlined the seriousness of the budget shortfalls that some of the CGIAR Centres are currently facing. At least three sister Centres have had to lay off between 150 and 600 staff members recently. The Director General reminded staff of the budget deficit of over US$1.0 million that ICARDA faces in 1997, and asked them that, in order to avert the painful need to cut staff positions, they find ways to cut unneces-

sary expenditure wherever possible, for example, reducing the use of stationery, phone and fax, electricity, and transport. He said he would send an e-mail to all staff inviting them to offer their suggestions as to how to cut expenditure without cutting research. He emphasised that the strength of ICARDA and the sustainability of its funding lie in the quality of its research output.

Prof. El-Beltagy identified four areas for increased attention:

- *research related to water conservation and usage*
- *develop strong relationships with national programs and continue to strengthen research in biotechnology and genetic engineering*
- *develop links with the private sector as an alternative source of funding. There is a need to develop suitable proposals for submission to private sector companies, as donations by these companies may qualify for tax exemptions.*

To meet the budget realities, ICARDA proactively made adjustments in its research agenda. Shifts in priorities meant that some activities had to be downsized or dropped, and others added. This process was guided by the needs of the national programmes in a changing scenario of global priorities and the importance of the use of new tools of research, such as biotechnology, remote sensing, geographical information systems, and information technology. The staff numbers and expertise were critically reviewed to bring them in line with ICARDA's changing priorities. Adjustments within the staff teams meant both cutting some positions and replacing others with new expertise.

Fund-raising Strategy

At the same time, the Centre implemented a well-thought out and comprehensive fundraising strategy. This included personal contacts with donors, and increased public awareness activities. A three-pronged strategy was used: relations with traditional donors were further strengthened, new donors were approached, and ICARDA increased its involvement in projects of NARS. The examples of the externally funded bilateral last category include the Matrouh Project in Egypt, funded by Egypt; the Agricultural Resource

Management Project in Yemen, funded by Yemen, from their World Bank loans; and the projects in the Central Asian Republics, the Palestine Authority and Mauritania. The Centre was also successful in obtaining funds from non-conventional sources, such as the Global Environment Facility for a Dryland Agrobiodiversity Project.

These efforts have paid off. While the unrestricted core contribution has been showing a downward trend since the mid-1980s, the restricted funding has been going up (see Fig. 1 on page 141) to make up the deficit in core funding. This has helped to protect ICARDA's financial health and the integrity and usefulness of its research programmes.

9

Looking Ahead

The world is changing fast. ICARDA is in transition too but some things for the Centre never change. Commitment to improving food production and sustainable management of natural resources, to alleviating poverty and hunger in the dry areas, and to sharing technology in partnerships with the national agricultural research systems of developing countries.

At the dawn of the 21st century, ICARDA remains firmly fixed on the advancement of science in agricultural research; free exchange of germplasm and information for research purposes; protection of intellectual property rights, including indigenous knowledge of farmers; human resources development; the sustainable use of natural resources; and a reduction in poverty, particularly among women and children.

The increasing challenges of acute shortage of water, scarcity of productive land, an expanding population, and the threat of global warming combine to pose difficulties which must be surmounted. Worldwide in the dry areas, 840 million people are classed as hungry, while a further two billion suffer from malnutrition. These are merely 'snapshot' numbers that will rise even further unless the inexorable upward trend in population growth is checked.

In ICARDA's dry area mandate, the overall population growth rate is high, with national annual increases ranging from 3.6% in the Mediterranean region to 2.1% in the Central

Asian Republics of the former Soviet Union. Migration from rural to urban areas is widespread, and the rate of urban growth exceeds total population growth. These demographic changes have created socio-political and economic imbalances and dislocations that threaten food security, income improvement, and sustained progress in achieving development goals.

Pressure on already limited arable land is expected to increase even more in the new century. Since it takes a minimum of 0.07 hectares of arable land to feed one person, the net effect is that four billion people are likely to be affected by land scarcity by 2050. The prospects for millions of people in the dry areas are particularly alarming. Out of a population of one billion in 41 countries in these areas, 696 million have a per capita income of less than US$2 a day. About 300 million live below their nationally-determined poverty lines.

Disparities in the distribution of income are increasing, with smallholders, landless farmers and pastoralists being the most economically disadvantaged. Rural people, particularly women and children, suffer the most from poverty and its physical and social deprivations, which include malnourishment and high rates of infant mortality. There is evidence that for poorer countries, increases in incomes in the agricultural sector have a greater impact on countrywide income than increases in other sectors, and that economic growth and higher incomes reduce poverty. However, food security is still very much an issue in the dry areas.

The production-consumption equation for food grains for 2020 in 29 CWANA countries does not compute to an acceptable answer. By 2020, total grain consumption is expected to be 323 million tonnes against a total production of 247 million tonnes, even assuming a 2% annual growth rate in production. Exclude Turkey and Kazakstan from the calculation and the deficit in 2020 grows to a staggering 114 million tonnes—enough to fill a train 17,000 kilometers long!

ICARDA, with its focus on research and training to increase the production, productivity and nutritional quality of food, while preventing degradation of natural resources and protecting the environment, will seek to challenge this

2020 scenario with solutions and alternatives. The cost of doing nothing is high and includes impoverishment, unemployment, south to north migration and sociopolitical upheavals associated with it.

Within the ambit of a long-term strategy, allied to the agreed CGIAR agenda, ICARDA will continue to make the most efficient use of the available resources. Partnership has been a key element in the Centre's work during its 25 years, and collaboration and partnership with National Agricultural Research Systems (NARS) and with other advanced research institutes will remain central to ICARDA's game plan. It is through the NARS that the knowledge and techniques that might change the prognosis are best channeled to farmers and pastoralists.

Agricultural research can contribute to poverty alleviation through four strategic approaches:

- Technologies that simultaneously improve productivity and sustain natural resources and can be applied by poor people using low levels of external inputs;
- Resource management practices that conserve soil, water and vegetation and do not decrease productivity;
- More diversified farming systems that reduce economic risk, contribute to greater resource use efficiency, and provide higher returns to the farm community; and
- Improved vertical integration from producer to consumer, including enhanced quality and added value of farm products, improved post harvest processing and storage, and employment generation.

Priorities

ICARDA now places equal priority on two research themes—germplasm enhancement and integrated natural resource management. In terms of individual projects within these themes, the group of six highest priority projects is a mix of germplasm enhancement (barley, food legumes and durum wheat), natural resource management (water resource conservation and management and agro-biodiversity collection and conservation), and production systems

development (rehabilitation and improved management of native pastures and rangelands).

With the increased emphasis on poverty alleviation and sustainability of the production systems of resource-poor farmers, there is greater recognition that proper resource management practices and the means to achieve them are a necessity. This is acknowledged both in ICARDA's research agenda and those of its NARS partners in the dry areas.

Crop Germplasm Enhancement

The enhancement of mandate crops is long-term and will continue with the goal of increasing yield and stability over time through genetic improvement for water use efficiency; tolerance to drought, heat and salinity; and tolerance/resistance to diseases and pests, especially emphasising less-favoured environments and low external input systems.

Decentralized plant breeding in partnership with NARS is the approach now being used for crops for which the Centre has both global and regional mandates. ICARDA will maintain the responsibility for generating at its headquarters a continuous flow of genetic variability using both conventional methods and new biotechnology tools, while selection will be done by NARS in the target environments. To ensure strategic application of biotechnology tools, the facilities needed wil be expanded. New tools wil be selectively introduced in collaboration with ARIs. Participatory breeding is expected to accelerate adoption of new varieties, particularly by resource-poor farmers in less favourable areas.

ICARDA holds the largest gene bank in the southern Mediterranean region, with over 20% of the total germplasm accessions in the CGIAR Centres. In the continued exploration for genetic resources, emphasis will be given to the collection of germplasm from dry areas particularly low rainfall highland and rangelands. However, overall, the shift from collection and *ex-situ* conservation to germplasm characterisation, evaluation, documentation and use will be accelerated to exploit the biodiversity held at ICARDA and in its region. Work on *in-situ* conservation, in collaboration

with NARS, adopting integrated natural resource management, will be accelerated. The adoption of DNA-marker technology and the formation of core collections will improve the efficiency of germplasm collection management and use. Increased attention will be given to the techniques of *in-situ* conservation through promoting improved resource management in the dry areas.

Integrated Natural Resource Management

Water

The key challenge everywhere in the dry areas is water poverty. In its early years, ICARDA gave little attention to irrigated areas, believing that the greatest need lay in the rainfed farming systems. That need remains; but, as linkages between the production systems increase at the national level and as water becomes relatively scarcer, the needs of both rainfed and irrigated agriculture become more important. ICARDA must find the most efficient, conjunctive uses of all sources of water that are both profitable and acceptable to farmers. Across the spectrum of research in germplasm enhancement and production systems management, the central goal will be to increase water use efficiency for agricultural production at the farm level.

Among the ways of achieving that goal will be the development of technologies for making best use of limited water, building on indigenous knowledge and cutting-edge science. Breeding varieties more efficient in water use, and developing agronomic practices that are not wasteful of this valuable but limited resource, are the basic elements of these technologies. Considerable progress has been made in this regard, and the furure work will build on it. The emphasis on water harvesting systems, and the use of marginal quality water to improve the availability of this limited resource for agriculture will increase.

Land and Soil

Closely linked to water, research on land and soil will target

areas with a high risk of degradation due to climate and mismanagement, particularly where poverty prevails. Land and soil research will focus on watershed management and land reclamation. It will also emphasise development with users of systems to control erosion and salinisation, including long-term measures to conserve high-priority plant communities *in situ*.

Feed and Fodder

Serious problems associated with inadequate feed supply, declining soil fertility and reduced cropping diversification in the semi-arid and arid zones of CWANA are being tackled through the NRMP. On-farm trials and comparisons of rotational systems including barley and pasture or forage legumes will continue to be used to demonstrate to farmers the potential for increasing their output from livestock. On degraded rangelands and marginal lands, ICARDA will continue to develop management plans and low-cost techniques for rehabilitation using native species of fodder shrubs.

Small Ruminants

The Small Ruminant Production Project has been active in the improvement of feeding systems using barley straw, shrubs or feed blocks. In the future, increased attention will be given to the identification of opportunity niches for small ruminants and their products, particularly where value is added through the production of cheese or yoghurt. Efforts on genetic characterization of small ruminants in relation to market needs, and on conservation and utilization of these genetic resources for adaptation to harsher environment of dry area will increase.

New Opportunities and Challenges

The demise of the Soviet Union created a number of new independent republics in Central Asia and the Caucasus, a huge area sharing many of the problems already being faced

in WANA. Most of these republics had benefitted under the Soviet Union from the centralised extension and support services and from specialist agricultural research centres. These were predominantly geared, however, to a State system of large-scale farming and flock ownership. The fragmentation of these State units into smaller private businesses left the republics with major difficulties. Not only were established systems of farming no longer sustainable but the support and marketing infrastructures collapsed too.

Independence brought further uncertainties over land tenure, markets, crop and livestock enhancement, integrated supplies of winter fodder, and transport.

Many of the privatized farmers now have as few as 5-20 sheep in their flocks, particularly in Kyrgyzstan and Kazakstan where privatization has been most intense. Few farmers have larger flocks and most have abandoned the traditional open grazing by seasonal migration to steppe and semi-desert in favour of keeping these small flocks around their home villages where overgrazing and land degradation is now commonplace.

Other knock-on effects have been severe. It has proved impossible to retain the same level of organized breeding services as before, threatening the genetic quality of the remaining animals. This is coupled with similar disruption to the production of seed for forage and arable crops.

One-stop Shop

To deal with such extraordinary circumstances, ICARDA has been at the forefront in taking extraordinary measures. Of these, the most groundbreaking is the innovative Consortium for Central Asia and the Caucasus which has, for the first time, brought nine centres of the CGIAR together to form a 'one-stop shop' for the national agricultural research systems (NARS) coordinated by ICARDA.

UNDP/GEF Agrobiodiversity Project

Yet another groundbreaking project now being undertaken is the establishment of the Agrobiodiversity Project of the

United Nations Development Programme's General Environment Facility (GEF) managed from ICARDA headquarters. Again, this pioneering of *in-situ* conservation of landraces and their wild relatives, in conjunction with the NARS of Jordan, Lebanon, the Palestinian Authority and Syria, is being looked at as a model for other Centres and institutions to follow.

Future Harvest Consortium

There will be many other examples of more modest cooperation, each just as innovative in its own way. The latest effort is the launching of a Future Harvest Consortium for Rebuilding Agriculture in Afghanistan. The immediate aim of the Consortium is to start rebuilding the seed systems for important food crops, and lay a framework for longer-term activities in seeds and crop improvement; soil and water management; livestock, feed, and rangeland improvement; and horticulture. Another theme is to involve Afghan partners closely to create a sense of ownership in them, strengthen their capabilities, and ensure that the realities of the Afghan situation are reflected in all efforts. Along with ICARDA, the following Future Harvest Centres of the CGIAR are partners in the Consortium: the International Center for Tropical Agriculture (CIAT); International Center for Maize and Wheat Improvement (CIMMYT); International Potato Center (CIP); International Crops Research Institute for the Semi-arid Tropics (ICRISAT); International Food Policy Research Institute (IFPRI); International Livestock Research Institute (ILRI); International Plant Genetic Resources Institute (IPGRI); International Service for National Agricultural Research (ISNAR); and the International Water Management Institute (IWMI). USAID has taken the lead in supporting the initiative by providing US$ 9.5 million. IDRC and other donors have also shown interest in supporting the Consortium.

As has been seen throughout this history, ICARDA's first 25 years were marked by achievements in research, transfer of technology, and capacity building through NARS. Were it

not for the impact of these ICARDA-developed advances, WANA would now be facing even worse consequences from the expansion of population and degradation of natural resources of land, water and biodiversity that has continued to affect the region.

The Centre's mandate remains broad and complex. However, the ICARDA 'house' is now well and truly in order, and ready to meet the challenges of the next millennium.

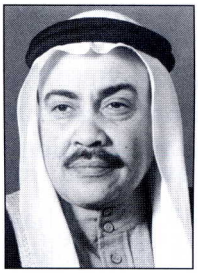
For a positive assessment of the future role ICARDA has to play, it is necessary only to turn to the report of the latest External Programme and Management Review Panel, which carried out its work in 1999. It commends ICARDA for coming through a period of transformation under conditions that would have daunted most institutions. The Panel finds that ICARDA has been so well reorganised, with a strong and effective management in place, that a kind of "dynamic consolidation" will carry it through to new positions in science where it will be regarded as:

- The lead Centre for integrated on-farm water management for the dry areas.
- A scientific Centre of Excellence serving as the regional node for a consortium of international efforts, both CGIAR and non-CGIAR, that focus on the CWANA region and the dry areas.

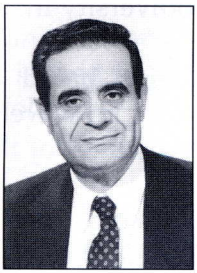
In urging donors to support its research efforts in the harsh, water-scarce environments of the dry areas, the Panel members were quite clear:

"ICARDA has made major efforts to achieve the objectives of its founders, and the need for ICARDA is just as great now as it was in 1977."

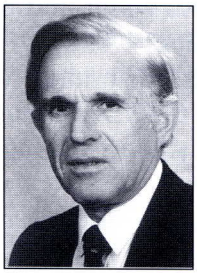
ICARDA Board Chairs



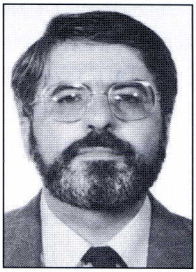
Dr Taher Obaid
1978-1980



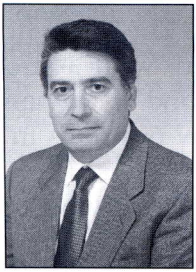
Dr Andreas Papasolomontos
1980-1985



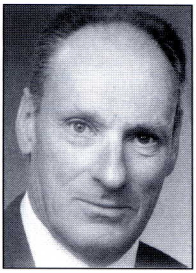
Dr Ekkehard Clemens
1985-1986



Dr Jose I. Cubero
1986-1989



Dr Enrico Porceddu
1989-1994



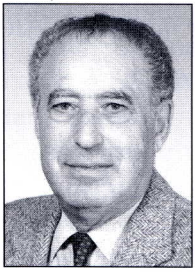
Dr Alfred Bronnimann
1994-1999

Dr Robert Havener
1999-

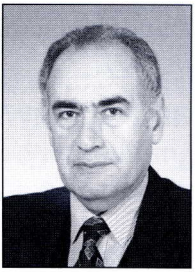
ICARDA Directors General

Dr Harry S. Darling
1977-1981

Dr Mohamed A. Nour
1981-1987



Dr Nasrat R. Fadda
1988-1995



Prof. Dr Adel El-Beltagy
1995-

Appendix 1

Participants in the First Bellagio Conference

Bell, David E., executive vice president, Ford Foundation, New York.

Boerma, Addeke H., director general, Food and Agriculture Organisation, Rome.

Fournier, F., Office de la Recherche Scientifique et Technique Outre-Mer, Paris.

Gardiner, Robert, executive secretary, United Nations Economic Commission for Africa, Addis Ababa.

Hannah, John A., administrator, U.S. Agency for International Development, Department of State, Washington, D.C.

Harrar, J. George, president, Rockefeller Foundation, New York.

Hoffman, Paul G., administrator, United Nations Development Programme, New York.

McNamara, Robert S., president, World Bank, Washington, D.C.

Martin, Edwin M., chairman, Development Assistance Committee, Organisation for Economic Cooperation and Development, Paris.

Michanek, Ernst, director general, Swedish International Development Agency, Stockholm.

Myers, Will M., vice president, Rockefeller Foundation, New York.

Ohuchi, T., operations manager, Asian Development Bank, Manila.

Sawaki, Masao, director general, Economic Cooperation Bureau, Ministry of Foreign Affairs, Tokyo.

Strong, Maurice, president, Canadian International Development Agency, Ottawa.

Wilson, Geoffrey, permanent secretary, Ministry of Overseas Development, London.

Wolf, Alfred C., program adviser to the president, Inter-American Development Bank, Washington, D.C.

Consultants

Bachmann, K.L., Food and Agriculture Organisation, Rome.

Chandler, Robert F., Jr., International Rice Research Institute, Los Banos, Philippines.

Clark, William D., World Bank, Washington, D.C.

Hardin, Lowell S., Ford Foundation, New York.

Henry, Paul-Marc, Bureau of Operations and Planning, United Nations Development Programme, New York.

Hill, Forrest F., Ford Foundation, New York.

Vallega, José, Food and Agriculture Organisation, Rome.

Wortman, Sterling, Rockefeller Foundation, New York.

Appendix 2

Members of the Consultative Group on International Agricultural Research*

African Development Bank
Asian Development Bank
Arab Fund for Economic and Social Development
Australia
Austria
Bangladesh
Belgium
Brazil
Canada
China, Colombia, Côte d'Ivoire,
Denmark
Egypt
European Commission
Finland
Food and Agriculture Organisation of the United Nations
Ford Foundation
France
Germany
IADB (Inter-American Development Bank)
IBRD (International Bank for Reconstruction and Development)
IDRC (International Development Research Centre)
IFAD (International Fund for Agricultural Development)
India
Indonesia
Iran
Ireland
Italy
Japan
Kellogg Foundation
Netherlands
New Zealand
Nigeria
Norway
Pakistan
Peru
Philippines
Portugal
Opec Fund for International Development
Rockefeller Foundation
Romania
Russian Federation
South Africa
Spain
Sweden
Switzerland
Syrian Arab Republic
Thailand
Uganda
United Kingdom
United Nations Development Programme
United Nations Environment Programme
United States of America
World Bank

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* CGIAR Research Highlights, Nourishing a Peaceful Earth: The CGIAR's Contributions. CGIAR Secretariat, The World Bank, Washington D.C., USA, November 2001.

Appendix 3

Terms of Reference of the CGIAR Subcommittee for the International Center for Agricultural Research in the Dry Areas (ICARDA)

(a) Exploring appropriate arrangements with host countries for the establishment of ICARDA and examining the welcome likely to be accorded to its operations by these and other countries and institutions of the Middle East region interested in its objectives;

(b) Until the appointment of an executing agent under item (c), the Subcommittee will:

- prepare draft agreements and appropriate by-laws, or other documents necessary for the establishment and operation of ICARDA as an independent legal entity with the authority required to achieve its objectives;
- develop a draft constitution of ICARDA's Board of Trustees
- identify suitable site(s) for the operation of ICARDA
- employ such temporary consultants as necessary for the preparatory work;
- initiate planning for the research programme including estimates of annual research budgets; and
- initiate site and facility planning, including engaging architectural or other services necessary to the preparation of capital development budgets.

(c) Subject to the tailoring of programmes to the level of financial support arranged through the CGIAR, the Subcommittee will appoint an executing agent who will, under the guidance of the Subcommittee, continue the tasks outlined in (b) and who will enter into the signing and registration of the documents necessary to establish and assure the continued operation of ICARDA as an independent legal entity, acquire suitable lands, and appoint a Project Operations Officer to carry out the initial phase of the development of experimental facilities, including laboratories, and the programme of research work of the Centre, until such time as the first Board of Trustees has been designated and takes charge of the Centre.

Appendix 4

CGIAR Subcommittee for an International Center for Agricultural Research in the Near East and North Africa

First Meeting, February 10-11, 1975 FAO, Rome

List of Participants

Chairman: Dr W. David Hopper
Secretary: Mr John Coulter

Australia:	Mr D. Mentz
Belgium:	Prof. De Langke
Canada:	Mr J. Lobsinger
FAO:	Prof. M. Nour
Ford Foundation:	Mr D.E. Bell
	Dr L.S. Hardin
France:	Mr H. Vernede
Germany:	Mr H. Schmidt-Burr
IBRD:	Mr J.M. Fransen
IDRC:	Mr J.H. Hulse
	Mr S. Dessouki
	Miss S. Plouffe
Netherlands:	Prof. G.J. Koopman
Rockefeller Foundation:	Dr J. MacKelvey
United Kingdom:	Dr A.R. Melville
	Dr R.K. Cunningham
UNDP:	Mr W.T. Mashler
United States:	Mr C. Farrar
	Dr G. Baird
CGIAR:	Mr W.C. Baum
	Mr M.L. Lejeune
TAC:	Mr P. Oram
	Mr W. McNally
ALAD:	Dr R. Havener
	Dr E. Saba, Lebanon

Appendix 5

Members of ICARDA Board of Trustees 1977-2004

Name	Term	Nationality
Mcwilliam, James	1976-1981	Australia
Joma'a, Salah	1976-1977	Syria
Havener, Robert	1977-1978	USA
Nour, Mohamed	1977-1978	Sudan
Samii, Mehdi	1977-1979	Iran
Boukli, Noureddine	1977-1983	Algeria
Hardan, Adnan	1977-1983	Iraq
Koopman, Jan	1977-1983	Netherlands
Obaid, Tahir	1977-1982	Saudi Arabia
Solandt, Omond	1977-1982	Canada
Darling, Harry (Ex-Officio)	1977-1982	UK
El-Kurdi, Salah	1978-1979	Syria
Scarascia-Mugnozza, G	1978-1983	Italy
Tosun, Fahrettin	1978-1983	Turkey
Haraoui, Joseph	1979-1990	Lebanon
Papasolomontos, Andreas	1980-1085	Cyprus
Hardin, Lowell	1980-1085	USA
Muhammed, Amir	1980-1985	Pakistan
Saoud, Hassan	1980-1990	Syria
Ebbersten, Stein	1981-1986	Sweden
Nour, Mohamed (Ex-Officio)	1981-1987	Sudan
Lasram, Mustafa	1981-1987	Tunisia
Fischer, R	1981-1987	Australia
Clemens, Ekkehard	1981-1986	Germany
Anthony, Kenneth	1982-1987	UK
Al-Shayji, Naima	1983-1989	Kuwait
Cubero, Jose Ignacio	1983-1989	Spain
Conesa, Alfred P	1985-1991	France
Nabulsi, Hasan	1985-1991	Jordan
Merei, Hamid	1985-1989	Syria
Gotsch, Carl	1986-1992	USA
Poulovassilis, Alexander	1986-1989	Greece
Demir, Nazmi	1986-1992	Turkey

Rabbinge, Roelof	1987-1993	Netherlands
Porceddu, Enrico	1987-1994	Italy
Fadda, Nasrat (Ex-Officio)	1988-1995	UK
Faraj, Hoceine	1988-1994	Morocco
Ouellette, Gerard	1988-1994	Canada
Halse, Norman	1988-1994	Australia
Von Urff, Winfried	1988-1994	Germany
Subei, Abdul Rahim	1989-1991	Syria
Riley, Ralph	1989-1992	UK
Hamze, Mouin	1991-1999	Lebanon
Badawy, Mervat	1992-1997	Egypt
Some, George	1992-1997	Syria
Casas, Joseph	1993-1998	France
Istanbulluoglu, Ersin	1993-1998	Turkey
Noolan, Julie Virgo	1993-1998	Australia
Yoshida, Tomio	1993-1994	Japan
Ismail, Toufik	1993-2004	Syria
Bronnimann, Alfred	1994-1999	Switzerland
Coffman, Ronnie W	1994-1999	USA
El-Beltagy, Adel (Ex-Officio)	1995-2005	Egypt
Ahoonmanesh, Ali	1995-2000	Iran
Alaoui, Assia	1995-2000	Morocco
Davies, John C	1995-2000	UK
Dudal, Raoul	1996-2001	Belgium
Monti, Luigi	1996-2001	Italy
Kobori, Iwao	1997-2002	Japan
De Nuce de Lamothe, Michel	1998-2003	France
El-Zabri, Ismail	1998-2003	Jordan
Havener, Robert	1998-2003	USA
Sharafeldin, Mamdouh, A	1998-2003	Egypt
Oberaspach, Peter Franck	2000-2002	Germany
Al-Ahmad, Hassan	2000-2002	Syria
Catley-Carlson, Margaret	2001-2003	Canada
Jones, R Gareth Wyn	2001-2003	UK
Kazzaka, Khalil	2001-2003	Lebanon
Keshavarz, Abbas	2001-2003	Iran
Ketema, Seyfu	2001-2003	Ethiopia
Fogelberg, Teresa	2002-2004	Netherlands
Rao, Rosa	2002-2004	Italy

Appendix 6

The ICARDA International School of Aleppo

Nurturing a New Generation

The ICARDA International School of Aleppo (IISA) was founded in 1977 to serve the children of the senior staff of the Centre under the terms of an agreement signed with the Syrian Government. This agreement accepted that English would be the language of instruction in the school but stipulated that Arabic should be taught for at least two hours per week.

At first only children of ICARDA international staff, of other expatriate workers in Syria, and of ICARDA's Syrian staff, with Ministry of Education approval, could attend the school. That first intake comprised just eight students and was housed in an apartment building in Shahba, an upper-class residential area of Aleppo.

However, by 1979 the school had grown to 45 students ranging from kindergarten to grade six. The staff consisted of a principal and three full-time teachers.

From 1981-1987 the school catered for kindergarten to grade 8 students. As more students were enrolled, so each grade level became self-contained and more teachers were employed. Due to the nature of the ICARDA community, emphasis was placed on the teaching of science even at the lower elementary level.

Until 1987 the senior staff at ICARDA had no alternative but to send their children to boarding schools outside Syria once they had completed the eighth grade. However, due to parent interest, the decision was made to expand the school through to grade 12. The class of 1991 was the first to graduate with an IISA High School Diploma. With this began the tradition of commencement ceremonies at the Citadel of Aleppo.

A number of significant changes took place in 1987. The International General Certificate of Secondary Education set from Cambridge, England, was adopted as an external assessment exam for students in grade 10. In this same year the school moved to its present site in the old Office 1 complex, following the transfer of the main ICARDA office to its purpose-built premises at Tel Hadya.

This move located the school on a 1.6 hectare-campus within the perimeter of the city of Aleppo. The facilities have grown to include 25 classrooms, three science labs, two computer labs, a music room, an art centre, a library with media centre, an auditorium, an athletic field, a basketball court and two tennis courts.

Continuing its aim of gaining international recognition for its efforts and those of its students, the school was awarded American accreditation in 1991 from kindergarten through grade 8 by the Middle States Association of Colleges and Schools. Subsequently, full accreditation through to grade 12 was granted in 1997.

Making 1991 another key year in its development, the school adopted the International Baccalaureate (IB) as an externally-examined secondary diploma recognized in many countries of the world. The first IISA students to receive an IB diploma graduated in 1993. While the majority of IISA graduates go on to attend university in Lebanon, others have entered universities in the United States, Canada and other countries.

In 2001 the elementary school began implementing the I.B. Primary Years Programme and hopes to soon be a fully authorized school. The year also saw the introduction of a Middle School comprising grades 6 and 7. grade 8 will also be incorporated into the Middle School.

During the 2001-02 year, the school had 251 students of 15 nationalities, 28% of the them being children of ICARDA staff. There were 122 students in Elementary and 91 students in Secondary. There are 35 full-time faculty, 6 part-time, and 14 teacher assistants.

From its humble beginnings the school has now grown full circle and has very much established itself in the Aleppo community and is considered one of the best in the region.

Appendix 7

Top Forty Donors to ICARDA
1977-2001

1. World Bank
2. United States of America
3. Germany
4. Netherlands
5. Italy
6. International Fund for Agricultural Development
7. Arab Fund
8. United Kingdom
9. European Commission
10. Canada
11. Sweden
12. Australia
13. Iran
14. Norway
15. United Nations Development Programme
16. OPEC Fund
17. International Development Research Center
18. Denmark
19. Japan
20. Ford Foundation
21. France
22. Egypt
23. Spain
24. Yemen
25. Saudi Arabia
26. Switzerland
27. Austria
28. Syria
29. Luxembourg
30. Belgium
31. Pakistan
32. Asian Development Bank
33. Ethiopia
34. China
35. Finland
36. India
37. United Nations Environment Programme
38. Korea
39. Food and Agriculture Organisation of the United Nations
40. Near East Foundation

Acronyms

ACSAD	Arab Center for the Studies of Arid Zones and Dry Lands (Syria)
ALAD	Arid Land Agricultural Development (Lebanon)
AOAD	Arab Organization for Agricultural Development (Sudan)
AUB	American University of Beirut (Lebanon)
AFESD	Arab Fund for Economic and Social Development (Kuwait)
APRP	Arabian Peninsula Regional Programme
ARIs	Advanced Research Institutes
AZRI	Arid Zone Research Institute (Quetta, Pakistan)
CAC	Central Asia and the Caucasus
CACRP	Central Asia and the Caucasus Regional Programme
CGIAR	Consultative Group on International Agricultural Research (USA)
CIAT	Centro Internacional de Agricultura Tropical (Colombia)
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo (Mexico)
CIP	International Potato Center (Peru)
CLIMA	Center for Legumes in Mediterranean Agriculture (Australia)
CWANA	Central and West Asia and North Africa
EARO	Ethiopian Agricultural Research Organization (Ethiopia)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations (Italy)
GCC	Gulf Cooperative Countries
GEF	Global Environment Facility
GIS	Geographic Information System
GTZ/BMZ	German Agency for Technical Cooperation (Germany)
HRP	Highland Regional Program
IARCs	International Agricultural Research Centers
IBRD	International Board for Research and Development
ICARDA	International Center for Agricultural Research in the Dry Areas (Syria)
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics (India)

IDRC	International Development Research Centre (Canada)
IFAD	International Fund for Agricultural Development (Italy)
IFPRI	International Food Policy Research Institute (USA)
IISA	ICARDA International School of Aleppo (Syria)
IITA	International Institute of Tropical Agriculture (Nigeria)
ILCA	International Livestock Centre for Africa (Ethiopia)
ILRI	International Livestock Research Institute (Kenya)
INRA	Institut National de la Recherche Agronomique (Morocco)
INRAT	Institut National de la Recherche Agronomique de Tunisie (Tunisia)
INRM	Integrated Natural Resource Management
IPGRI	International Plant Genetic Resources Institute (Italy)
IRRI	International Rice Research Institute (Philippines)
ISNAR	International Service for National Agricultural Research (The Netherlands)
IWMI	International Water Management Institute (Sri Lanka)
LARP	Latin America Regional Programme
NARS	National Agricultural Research Systems
NCAID	National Center for Agricultural Information and Documentation
NGO	Non-Governmental Organization
NVRSRP	Nile Valley and Red Sea Regional Programme
OPEC	Organization of the Petroleum Exporting Countries (Austria)
PARC	Pakistan Agricultural Research Council (Pakistan)
PFU	Program Facilitation Unit (Tashkent)
SAREC	Swedish Agency for Research Cooperation with Developing Countries (Sweden)
SIDA	Swedish International Development Cooperation Agency (Sweden)
SINGER	System-wide Information Network for Genetic Resources
TAC	Technical Advisory Committee
UN	United Nations
UNDP	United Nations Development Programme (USA)
USAID	United States Agency for International Development (USA)
USDA/ARS	United States Department of Agriculture/ Agricultural Research Service
WARP	West Asia Regional Programme
WANA	West Asia and North Africa

A Promise of Hope

ICARDA-04/1000/April 2002