

Algeria and ICARDA

Twenty-Five Years of Collaboration

Ties that Bind



ICARDA

International Center for Agricultural Research
in the Dry Areas

Algeria and ICARDA

**Twenty-five Years of Collaboration in Scientific Agricultural
Research between the Democratic and Popular Algerian Republic
(DPAR)
and the
International Center for Agricultural Research
in the Dry Areas (ICARDA)**

**Ties that Bind
No. 20**



International Center for Agricultural
Research in the Dry Areas (ICARDA)



Institut National de la Recherche
Agronomique d'Algérie (INRAA)



Institut Techniques des Grandes Cultures
(ITGC), Algérie

Donors to the Algeria/ICARDA program

The Algeria/ICARDA collaborative research program covers such areas as production of cereals and food legumes, integrated crop and live-stock systems, water management and capacity building. Several components of the research program have been generously supported by the following donors:

Donor (s)	Collaborative project
IFAD and AFESD	Research and development project on the production system of cereals, food legumes and forages in Sidi-Bel-Abbes region
IFAD, AFESD, IDRC, CAPRI, and FEMISE	Integrated crops and livestock production systems in the low rainfall areas of the Mashreq and Maghreb region
IFAD	West Asia and North Africa durum dry land improvement network (WANADDIN)
AFESD	Use of molecular techniques and biotechnology (biotechnology for the Arab World)
IFAD	Integrated research and durum economics network (IRDEN)
FEMISE	Les obstacles aux transferts technologiques dans les petites et moyennes exploitations agricoles des zones arides et semi-arides du Maghreb
SDC	Sustainable management of the agropastoral resource base in the Maghreb
SDC	Improving the livelihoods of rural communities and natural resource management in the mountains of the Maghreb countries of Algeria, Morocco and Tunisia

Acronyms

AFESD	Arab Fund for Economic and Social Development
CAPRI	CGIAR Systemwide Program on Property Rights and Collective Action
CGIAR	Consultative Group on International Agricultural Research
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CWANA	Central and West Asia and North Africa
FAO	Food and Agriculture Organization
FEMISE	Euro-Mediterranean Forum of Economic Institutes
GIS	Geographical Information Systems
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDRC	International Development Research Center
IFAD	International Fund for Agricultural Development
INRAA	Institut National de la Recherche Agronomique d'Algérie
IRDEN	Integrated Research and Durum Economics Network
ITGC	Institut Techniques des Grandes Cultures
NARS	National Agricultural Research Systems
SDC	Swiss Agency for Development and Cooperation, Switzerland
WANADDIN	West Asia and North Africa Durum Dryland Improvement Network

Introduction

Algeria is one of the largest countries in Africa, covering more than two million square kilometers. However, only about 8.6 million hectares, or 3.5% of its total area is used for agricultural production. Although agriculture does not contribute significantly to the country's GDP (Gross Domestic Product), it is an important sector which contributes to food security for the 30 million people in the country and provides employment to the rural population. Therefore, since independence in 1962, Algeria has continued to give priority to agricultural research and development both for social and economic reasons.

Cereals are the predominant crops grown by Algerian farmers, covering annually 3 to 3.5 million hectares, nearly 40% of Algeria's total agricultural land. Irrigated cereals cover about 50,000 hectares. Scarcity and poor quality of underground water resources, low and erratic rainfall, drought recurrence, high temperatures and salinity are the key constraints to agricultural production. ICARDA has been working with the national agricultural research system (NARS) in Algeria to address these constraints.

Algeria and ICARDA

Since its establishment in 1977, ICARDA has played a key role in strengthening agricultural research and development in Algeria through the implementation of regional research and development projects involving many Algerian scientific and technical institutions. The partnership started with exchange of germplasm, training and visits, and research planning.

The partnership between ICARDA and Algeria was further strengthened with the signing, in September 1986, of an agreement of collaboration between Algeria's Ministry of Agriculture and ICARDA. This has led to several projects including those on improving rainfed cereals, food legumes and forages and associated agronomic practices.

In 2003, an ICARDA liaison office was opened at the Institut National de la Recherche Agronomique d'Algerie (INRAA) to strengthen partnership and improve communication between the Center and Algeria's national program. This followed the signing of a memorandum of understanding between Algeria's Ministry of Agriculture and ICARDA to backstop the activities of the National Plan for Agriculture and Rural Development.



Dr Kamel Feliachi (left), INRAA Director General, and Dr Mohammed El-Mourid, Coordinator of ICARDA's North Africa Regional Program, cut the ribbon on a new ICARDA liaison office at INRAA in Algiers.

The memorandum of understanding specifies priority areas for the collaboration, including:

- Improvement of cereal production in suitable environments
- Development of production systems and natural resource management
- Agroecological characterization of the production zones and map production for high productivity soils in the high potential areas
- Opening of a Reference Farm Observatory within the National Rural Development Action Plan
- Development of a plant genetic resources bank
- Promoting Algeria as a center of excellence for durum wheat technological quality

Major achievements

Germplasm development and exchange

Collaboration between ICARDA and Algeria in germplasm development and exchange has been strong, covering rainfed cereals, food

legumes, and, to a lesser extent, forages. The collaboration has focused on the following areas:

- Testing adapted germplasm received from ICARDA, which has resulted in the identification of superior cultivars for the various production areas, and using improved germplasm with specific traits in the national breeding program.
- Testing nationally produced germplasm at ICARDA’s main experimental station at Tel Hadya, Syria, as well as in other parts of the Maghreb region for various abiotic and biotic stresses.
- Upgrading laboratory facilities to determine quality characteristics of the selected cultivars.

During the last two decades, a total of 1625 nursery sets (Table 1) have been screened in Algeria to identify those with resistance to biotic and abiotic stresses, high yield and good grain quality. ICARDA has trained many Algerian scientists in plant breeding and other disciplines of agriculture. The Center has also organized joint collection missions with Algerian scientists for new genetic materials from the country.

Table 1. Sets of germplasm supplied by ICARDA to Algerian NARS during the last two decades.

Crops	Species	Number
Cereals	Durum wheat	369
	Bread wheat	261
	Barley	319
	Sub-Total	949
Food legumes	Chickpea	320
	Lentil	210
	Faba bean	80
	Peas	22
	Other species	44
	Sub-Total	676
	GRAND TOTAL	1,625

Varieties released from ICARDA germplasm

Many cereal varieties have been released since 1983, and multiplied by the formal seed system. Several of these varieties are still grown in large areas across the country (Table 2).

Improved varieties of food legumes resistant to cold temperatures and diseases can now be planted in winter. They produce higher yields than the local ones which are susceptible to cold and diseases. Expectations are that national crop production will continue to increase as legumes regain lost acreage following rapid adoption by farmers who have seen their beneficial effect in crop rotations. Legumes are expected to expand further as they are a major ingredient in most national dishes, and, despite rapidly increasing populations, imports are likely to reduce.

Table 2. Varieties released from ICARDA germplasm during the last two decades.

Species	Variety and year of selection
Durum wheat	'Sahel 77' (1983), 'Waha' (1986), 'Korifla' (1988), 'Kebir 03' (1989), 'Oum Rabi 09' (1992), 'Belikh 02' (1993), 'Heider' (1994), 'Sham 3' (1995)
Bread wheat	'Sétif 82' (1982), 'Zidane 89' (1989), 'Sham 4' (1991), 'Nesser ' or 'Sham 6' (1992), 'Sidi Okba' or 'Sham 4' (1992), 'Mimouni' (1994)
Barley	'Hamel' (1987), 'Rihane 03' (1988), 'Soufara' (1989), 'Badia' (1990), 'El Fouara' (1994)
Triticale	'Ifri' or IFTT 314 (1995)
Chickpea	'Chetoui 1' or ILC 3279 (1984), 'Chetoui 2' or ILC 482 (1985), FLIP 85-54 C (1988), FLIP 85-17C (1989) FLIP 84-79 C (1989), FLIP 84-92 C (1991), FLIP 82-150C (1993), FLIP 90-13 C (1993)
Lentil	NEL 468 (1983), 'Balkan 755' (1983), 'Syrie 229' (1983), ILL 4400 (1986), NEL 45R (1990)

Highlights of collaborative research

Barley

Most of the barley in Algeria is grown in harsh, unpredictable drier environments with no chemical inputs. Introduction of a participatory breeding approach during the past few years has enabled the development of cultivars for specific adaptation to such environments. The objective is to improve barley productivity under small farmers' conditions by exploiting specific adaptation and by making use of indigenous knowledge.



Screening ICARDA cereal germplasm at an ITGC experiment station.

The collaborative participatory barley breeding program involves Algerian breeders and farmers as equal partners in the entire breeding process. ICARDA ensures continuous flow of genetic variability, and selection is made in the target environments of the country. Farmer participation in early selection of segregating populations has resulted in the selection of lines that meet the needs of farmers and are adapted to their specific environments.

Wheat

Algeria is one of the world's leading importers and consumers of durum wheat. Durum wheat is used for making couscous, local bread

or "galette" and *frike*—made from immature green seed that is dried, grilled and broken. The Algerian wheat program has a close bilateral relationship with the joint CIMMYT/ICARDA Wheat Improvement Program based at ICARDA headquarters. This program aims to assist Algeria to enhance wheat production, mostly durum wheat, in order to reduce imports. It emphasizes the use of landraces and wild relatives in breeding to develop germplasm that is better adapted to Algerian environmental conditions. As a result of this close collaboration, most of the released varieties until the mid-1990s were derived from CIMMYT/ICARDA germplasm. Since 1995, the germplasm movement to Algeria has slowed down, reflecting the improved capacity of the national breeding program through human resource development efforts undertaken jointly with ICARDA.

Chickpea

Soon after its establishment in 1977, ICARDA started a joint research program with ICRISAT to enhance the productivity and yield stability of chickpea. In the Mediterranean region, chickpea is traditionally planted in spring. The major constraints are heat and drought stresses towards maturity, which result in low and variable yields. Work under this program soon established that winter sowing could double the yield, but the winter sown crop was prone to damage by *Ascochyta* blight and cold.

A breeding program to combine resistance to *Ascochyta* blight and cold tolerance was established. The chickpea program at ICARDA has carried out international yield trials in collaboration with ITGC since the 1980s. ICARDA has been an important source of chickpea germplasm to the Algerian NARS.

An extensive testing program, spanning over a decade, conducted in different agroecological conditions enabled the release of several chickpea varieties exhibiting resistance to cold and *Ascochyta* blight (Table 2, page 4). The relatively small seed size of the varieties adapted to winter sowing is the main reason why, in spite of its proven benefits, the diffusion of

winter chickpea technology has been below expectations. Nevertheless, winter sowing has lately been gaining ground in Algeria, especially in the western region which has a long history of chickpea production.

Lentil

The objectives of the collaborative work on lentil breeding are to improve yield potential and stability, drought tolerance/avoidance, disease resistance (rust and *Fusarium* wilt), plant erectness for mechanical harvesting, and seed quality (color, shape, proteins, cooking time, etc.). A number of improved lines have been tested, and new varieties developed and released (Table 2, page 4).



Winter chickpea technology is one of the promising technologies introduced in Algeria by ICARDA.



ILL 4400, a high yielding and large-seeded green lentil variety released in Algeria in 1988.

Faba bean

The collaborative research work on faba bean has concentrated on the alleviation of constraints imposed by diseases, mainly chocolate spot, Ascochyta blight and rust, and by the parasitic weed *Orobanche* spp., as well as on the improvement of the level and stability of faba bean yields. Screening of inbred lines produced from the germplasm collection has revealed lines with resistance to chocolate spot and other diseases and pests. Intensive work is underway at ICARDA to combine resistance to diseases, especially chocolate spot, and to the parasitic weed *Orobanche*.

Genetic resources

Three collection missions were carried out in Algeria between 1989 and 1991 by teams of mainly national and ICARDA scientists. The trips covered the entire northern agroecological environments, thus saving important germplasm resources for future use. These collection missions enabled the identification of 1696 accessions (Table 3), representing 24 genera.

Following these collection missions, characterization and evaluation work was carried out for barley, chickpea, faba bean, medicago, trifolium, vetches and lathyrus. It is expected that further exploitation of these resources will constitute an important area of cooperation between national and ICARDA scientists.

Table 3. Surveys and collection missions in Algeria in collaboration with ICARDA.

Year	Organizations	Genus and accessions
1989	ITGC ICARDA NARJ*	<i>Hordeum</i> (95), <i>Triticum</i> (79), <i>Aegilops</i> (49), <i>Cicer</i> (13), <i>Lens</i> (3), <i>Onobrychis</i> (1), <i>Pisum</i> (5), <i>Trifolium</i> (1), <i>Trigonella</i> (1), <i>Vicia</i> (16)
1990	ITGC ICARDA	<i>Hordeum</i> (25), <i>Triticum</i> (14), <i>Aegilops</i> (9), <i>Vicia</i> (8), <i>Cicer</i> (3), <i>Lens</i> (6), <i>Pisum</i> (5)
1991	ITGC ICARDA	<i>Hordeum</i> (1), <i>Aegilops</i> (11), <i>Vicia</i> (207), <i>Trifolium</i> (272), <i>Medicago</i> (414), <i>Astragalus</i> (114), <i>Scorpius</i> (69), <i>Coronilla</i> (41), <i>Hedysarum</i> (9), <i>Hippocrepis</i> (44), <i>Anthyllis</i> (11), <i>Lathyrus</i> (36), <i>Lotus</i> (42), <i>Melilotus</i> (45), <i>Onobrychis</i> (14), <i>Ononis</i> (10), <i>Ornithopus</i> (8), <i>Pisum</i> (5), <i>Potereum</i> (4), <i>Trigonella</i> (16), <i>Tetragonolobus</i> (2)
Total		Genera: 24 Accessions: 1696

* NARJ – National Agricultural Research Center, Tsukuba, Japan

The entire collection of these accessions is preserved in the Genetic Resources Unit of ICARDA and at Bari, Italy. Moreover, several collections composed of accessions of Algerian origin in the ICARDA

genebank were characterized and evaluated in several ITGC experimental sites during the 1992/93 to 1998/99 seasons. These were:

- 1992/93: 1060 durum wheat accessions
- 1994/95: feed legume accessions including 82 *Vicia*, 618 *Medicago*, 218 *Trifolium*, 36 *Melilotus*, 41 *Scorpiurus*, 35 *Coronilla*, 30 *Trigonella*, 17 *Hippocrepis*, 9 *Onobrychis* and 9 *Anthyllis*
- 1996/97: 256 *Trifolium* accessions
- 1998/99: 127 *Hordeum vulgare* accessions

Cereal quality

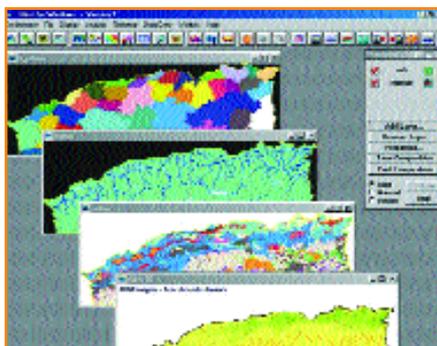
The various national institutions collaborating with ICARDA have cereal quality laboratories; however, their joint activities in this field are quite limited. Collaborative research on durum wheat quality started under the West Asia and North Africa Durum Dryland Improvement Network (WANADDIN) project. Within the Integrated Research and Durum Economics Network (IRDEN) project, which builds on the WANADDIN achievements, these activities were completed by a study of the durum production farm households. Selected local varieties and some from the ICARDA/CIMMYT germplasm were tested for their suitability to make couscous, bread, soup and cakes.

Agroecological characterization

Several national institutes are using Geographical Information Systems (GIS) to identify and pre-select sites for agricultural production. Since 1991, with the support of the Institute for Overseas Agriculture of Florence (IOA), Italy, ITGC implemented agroecological characterization (AEC) of Tiaret, Relizane, Mostganem, and Tissemsilt zones and northern Algeria to delineate potential durum growing areas. The use of GIS was intensified in collaboration with ICARDA during 2001. It enabled the characterization of Sidi Fredj community in Souk-Ahras province, on the Algerian-Tunisian border, within the framework of the Mashreq-Maghreb project.

Similar work was done within IRDEN project which focused on GIS use

for the evaluation of natural and socioeconomic resources of Ouled Bessem (Tissemsilt province) and Rahouia (Tialet province) which are the focal points of the project. The work was conducted by a national team member of IRDEN project, who had been trained in agroecological characterization (AEC) at the Regional Dryland Research Center, Settat, Morocco, under the Mashreq Maghreb project.



GIS has become a necessary tool for agroecological characterization.

Research units and laboratories of various national institutions are now full members of the national AEC team that was set up within the framework of the National Agricultural and Rural Development Plan. Future collaborative activities between ITGC, ICARDA and IOA in relation to GIS include: establishing a mechanism to involve all development actors and to precisely define the contribution of each institution to the agroecological and space management tasks.

Collaborative research projects

Research and development project on the production system of cereals, food legumes and forages in Sidi-Bel-Abbes region

This was the first in a series of projects in which ICARDA scientists were directly involved in field implementation. The intervention of ICARDA was within the framework of the Maghreb project which was funded by IFAD and AFESD between 1989 and 1995. The main goal of the project was to test, verify and establish improved field crops production techniques for the major rainfed cereals and food legumes in Sidi-Bel-Abbes province.

The major achievements were:

- Demonstration of improved varieties of barley, lentil, faba bean, and winter chickpea crops

- Development and transfer of crop management techniques that enable farmers to take full advantage of the new, improved varieties
- Development of potential "technological packages" for the various commodities

Integrated crops and livestock production systems in the low-rain-fall areas of the Mashreq and Maghreb region

Also known as the Mashreq-Maghreb (M&M) project, this was a very successful regional collaborative research project implemented in two phases (1995-1997 and 1999-2002). Its main objective was to develop more productive and sustainable small ruminant-based systems through the integration of crop and livestock production within and across barley and range-based systems. It enabled the Algerian national program to benefit from the experiences of seven other participating countries, four from the Mashreq (Iraq, Jordan, Syria, and Lebanon) and three from the Maghreb region (Tunisia, Libya and Morocco).



Participants of the Regional Technical and Planning Meeting of the Mashreq/Magreb project hosted by Algeria in November 2000 and inaugurated by His Excellency Dr Said Barkat, Minister of Agriculture.

In each of the participating countries, two communities were selected as pilot sites for the research activities. In Algeria, the selected communities were Sidi-Fredj in Souk-Ahras province and Mtoussa in Khenchela province. The project followed a multidisciplinary approach involving natural, biological and social sciences in order to support the

development strategy of the selected communities. The project also adopted the community approach in order to foster integrative efforts of the national teams, and evolved from a technology component testing program to one of integrated adaptive research that addressed aspects of communities in the low-rainfall areas from different perspectives.

One of the unique aspects of this project was that it studied policy and property rights as they relate to agricultural development, and assessed impact and adoption rates on crops and animal productivity. The project was coordinated by ICARDA and the Center's scientists provided technical backstopping on crops and livestock research and related development aspects, while support on policy and property rights issues was provided by IFPRI.

On-farm water husbandry (water harvesting, 1999-2002)

This was a CGIAR systemwide initiative aimed at the effective use of rainwater for agricultural production. The project assessed indigenous water harvesting techniques and compared them with more modern management techniques to optimize the use of scarce water resources for agricultural production. The impact of limited quantities of water applied on cereals, forages and shrubs in dry areas was assessed. Most importantly, farmers were introduced to management techniques that limit water runoff and optimize water harvesting.

West Asia and North Africa durum dryland improvement network - WANADDIN (1996-1999)

This project aimed to increase durum wheat production and reduce imports into the region by strengthening the CIMMYT/ICARDA/NARS collaborative research on durum wheat. The consolidation of this durum research network has enabled researchers to adequately cover the main durum agroecological environments of the Maghreb region. A different research thrust was associated with each environment.

In addition to the use of appropriate production techniques and superior cultivars, the project emphasized the importance of grain quality for the

production of pasta products. The collaborative research work has contributed to the identification of a number of durum varieties combining tolerance to drought, cold, and terminal stresses, enhanced disease and insect resistance, and improved grain quality.

Farmer participation and local knowledge in breeding barley for specific adaptation to dry areas

Participatory plant breeding is a partnership between researchers and farmers. Researchers generate plant populations with useful variability, and farmers select potentially useful lines from among those populations. The objectives of the project were to develop a participatory barley breeding approach for stress conditions; to select improved barley varieties that fulfil the needs of poor farmers in the marginal rainfed environments of Algeria; and to enhance the adoption rate of new varieties through farmers' participation in selection and testing.

IRDEN Project "Regional program to foster adoption of low-cost durum technologies" (2002-2006)

Though the emphasis is different, this could be considered as a continuation of the WANADDIN project. It acknowledges the strategic importance of durum wheat for the well-being of resource-poor smallholder households.

The project aims to improve and stabilize production by adopting superior varieties (higher yielding and with better quality) by following improved production practices and the initiation of on-farm grain transformation units to generate additional income in the low-resource areas of Algeria, Morocco, Syria, Tunisia and Turkey. In Algeria, the project zone encompasses the higher plateau communities of Ouled Bendahmane (Tissemsilt province), Zeffout (Tiaret province) and Ain Brahim (Setif province). The expected outputs of this collaborative project are:

- Improved durum varieties with resistance to drought and with good grain quality
- Efficient technology transfer methods to foster adoption of improved durum varieties and crop management practices, and promote sustainable production systems through farmer participation

- Methods and guidelines to enhance local organizational capacity to engage in seed production, processing, storage and distribution of adapted modern varieties
- Improved understanding of indigenous processing systems and skills and techniques to improve their efficiency and profitability



Field training is one of the best methods of knowledge transfer.

FEMISE II Project "Les obstacles aux transferts technologiques dans les petites et moyennes exploitations agricoles des zones arides et semi-arides du Maghreb" (2003-2004)

The project is looking into constraints to adoption and transfer of improved technologies to small and medium size farms in the arid and semi-arid zones of the Maghreb. It aims at completing the work of the M&M project which looked into integrated approaches to understand the constraints to adoption of technologies by agropastoral semi-arid production systems. Community modeling using mathematical programming and integrating socioeconomic and agronomic constraints is the central methodology of this project. The objective is to assess impact of agricultural policy changes on farm survival in agropastoral zones and related equity and sustainability. Thus, FEMISE seeks to integrate policy and technical factors to develop regional models.

Sustainable management of the agropastoral resource base in the Maghreb (Phase II) - (2003- 2005)

Pastoral areas continue to degrade due to expanding cereal cropping,



An Algerian scientist discussing with a farmer the merits of salibush and spineless cactus, tested by ICARDA, as winter and emergency feed for live-stock and to prevent soil erosion and land degradation.

overgrazing, consecutive years of drought, and demographic pressure. This project is looking into the environmental dynamics, the prevailing practices and use of the resources as well as socioeconomic and political factors causing the degradation. The study is focusing on agropastoral practices to understand the complexity of factors behind the management of agropastoral resources. The ultimate aim of the project is to develop appropriate procedures for range management and rehabilitation by involving local communities, authorities and other partners.

Improving the livelihoods of rural communities and natural resource management in the mountains of the Maghreb countries of Algeria, Morocco and Tunisia (2004-2006)

This project seeks to promote a rural development plan to increase income, preserve natural resources and reduce poverty through the establishment of intensive but durable production systems in the mountainous

areas. It will develop a strategy based on the sustainable intensification concept, which strives to intensify and/or diversify agricultural production while preserving the natural resources used in agricultural production and to reduce poverty. The expected outputs from this project are:

- Crop production intensified and diversified
- Local small ruminants (sheep and goats) and cattle production improved
- On-farm processing and marketing of mountain products improved
- Research capacities on highland agriculture upgraded and farmers' exchange of skills and experiences enhanced at both national and regional levels

Community-based optimization of the management of scarce water resources in agriculture in WANA region (2003-2006)

With the full participation of rural communities, the project will develop and test water management options that increase water productivity, optimize water use, and are economically viable, socially acceptable and environmentally sound. The project focuses on specific opportunities for three agroecological systems: supplemental irrigation for the rainfed areas, water harvesting for the drier environments and increased water-use efficiency in fully irrigated areas.

Maghreb oat and vetch improvement network (REMAV)

The high nutritive value of the feed resulting from mixed cultivation of vetch with small-grain species, especially oats, has been recognized by farmers for many decades and is spread all over the country. However, Algeria relies more on imports of vetch and oats, due to seed scarcity on the domestic market. To address this, a collaborative research program was launched with ICARDA and FAO which has led to the formation of the REMAV network of scientists from Algeria, Libya, Morocco and Tunisia. The objectives of the network are:

- Introduction and testing of Maghreb germplasm resources, mainly oats and vetch
- Screening of oats and vetch resources and their use in breeding to produce adapted genotypes with desirable traits
- Supporting farmers and training them to meet their oat and vetch seed needs

Human resource development

ICARDA has always emphasised the importance of capacity building of national scientists so they can work as equal partners in collaborative research. During the last two decades, 458 scientists and technical staff from Algeria have participated in the various training programs of ICARDA. Thirty-five researchers and technicians, primarily from ITGC cereals, food legumes and forage improvement programs, benefited from ICARDA's long-term training programs. In addition, ICARDA scientists have supervised several Algerian scientists who have now obtained PhD degrees.



A farmer field day on food legumes cultivation at Setif experimental station.

Prospects for future collaboration

In view of the significant achievements of the collaborative work between Algeria and ICARDA, an agreement was signed by both parties in 2003 to consolidate achievements and support priority initiatives as identified by the national program in Algeria. This provides a framework for collaborative work aimed mainly at the implementation of the National Plan of Agricultural and Rural Development. In addition, the following areas will require close attention to enable Algeria achieve food security:

- Greater emphasis on tolerance to abiotic stresses and resistance to pests and diseases in future variety development work

- Improvement of technical practices for crop management such as water management, land preparation, as well as agroecological characterization of food crops production areas
- Development of technical options to solve the problem of yield-reducing weeds and parasitic plants, mainly *Bromus* in cereals and *Orobanche* in food legumes
- Strengthening socioeconomic research through adoption and impact studies of developed technologies and better socioeconomic characterization of the production zones
- Development of seed production, mainly for food legumes and forages
- Increasing support to national staff capacity building including studying for PhDs, attending regional and international conferences, and short-term training.

Algerian scientists at ICARDA

Dr Noureddine Boukli, Member of ICARDA Board of Trustees, 1977 - 1983.

Dr Abderazak Belaid, Agroeconomist, 1996 - 2003

Dr Kamel Chabane, Biotechnology Specialist, 1996 to present

Dr Malika Martini, Socioeconomist, 1987 to present

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