

# Ethiopia and ICARDA

## Ties that Bind



International Center for Agricultural Research  
in the Dry Areas

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### **Headquarters**

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

PO Box 5466, Aleppo, Syria

Tel: (+963) (21) 2213433, 2213477

Fax: (+963) (21) 2213490

E-mail: [icarda@cgiar.org](mailto:icarda@cgiar.org)

Website: [www.icarda.org](http://www.icarda.org)

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Ties that Bind  
No. 29



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

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## Foreword

Ethiopia and ICARDA have worked together for more than 30 years, to promote sustainable agricultural development in dry areas. This booklet describes the results of this partnership: new technologies and research methods, growth in technology adoption, and significant impacts on food security, incomes and livelihoods.

These successes were due to several factors, most importantly strong commitment from the Ethiopian government, the skills and dedication of researchers and extension staff, and generous support from development investors. However, much more remains to be done. Ethiopian farmers, particularly in the dryland areas, face multiple challenges – drought, heat, land degradation, diseases, insect pests, and many others. Many of these problems will be exacerbated by climate change. Ensuring food security and healthy agro-ecosystems will require even greater efforts by researchers, development agencies and national policy makers.

My own experience in Ethiopia has been highly rewarding. As a lentil breeder, and later as Coordinator of ICARDA's Nile Valley and Red Sea Program in the 1990s, I had the privilege of working with researchers, extension agents and farmers in different parts of the country. Several of my Ethiopian colleagues are now in leadership positions, helping to link Ethiopian research even more closely with ICARDA and other international centers. A number of new research-for-development projects have been launched. I am confident these projects will be as successful as previous ones; and that together, we will help improve agricultural productivity, environmental sustainability, food security and livelihoods for rural households in Ethiopia and beyond.



Mahmoud Solh  
Director General, ICARDA





*New technologies, strong partnerships... and direct, measurable impacts on food security and livelihoods*

## Science for food security

Agriculture accounts for about half of Ethiopia's GDP, 60% of export earnings and 80% of total employment. The country's economic development will depend, in large part, on sustainable improvements in agriculture. ICARDA is ideally placed to contribute to national R&D efforts, for several reasons. The Center's work focuses on small-scale farmers in dry areas; its mandate includes some of Ethiopia's most important crops; it has strong linkages with research centers, development organizations and other partners worldwide.

Partnerships between Ethiopian agricultural research centers and ICARDA began in 1978, soon after the Center was established. Collaboration with the Ethiopian Institute of Agricultural Research (EIAR) on germplasm exchange and training helped establish the country's first legume research program. In 1985, Ethiopia formally joined a regional research program coordinated by ICARDA, that initially focused on the Nile basin and subsequently expanded to a number of countries in sub-Saharan Africa. Ethiopian scientists play a key role in the regional program. EIAR is a 'lead center' in research networks on wilt and root rot diseases in legumes, and stem rust disease in wheat, and Ethiopian scientists are helping to generate international public goods that are being used across Asia, Africa, Latin America and Europe.

Twelve Ethiopian scientists have worked at ICARDA (five at present), and several others have served as technical consultants. Dr Seyfu Ketema, Executive Secretary of ASARECA and former Director General of EIAR, served on ICARDA's Board of Trustees for six years.

Collaborative research is implemented through regional and bilateral programs on food legumes, barley, wheat, seed systems, water and land management, livestock, and capacity development. Technologies developed through these partnerships have made a significant impact in Ethiopia. But they are also applicable to many other areas (e.g. highlands across East Africa) with similar agro-ecologies and cropping systems. ICARDA is helping to realize the 'international public goods' benefits through its Nile Valley and

sub-Saharan Africa Regional Program, which helps share germplasm and information, and provides technical backstopping to partner countries to test, adapt and promote these technologies.

This partnership continues to grow. ICARDA's new office in Addis Ababa was inaugurated in October 2009, following the signing of a Memorandum of Understanding with the Ministry of Agriculture and Rural Development (MoARD). The office, hosted by the International Livestock Research Institute, will provide technical and logistic support for collaborative research in several other countries in sub-Saharan Africa.



*The new MoARD-ICARDA agreement will further strengthen a 30-year partnership*

## Conserving biodiversity

Ethiopia's diverse environments contain a vast pool of genetic resources. ICARDA and other international research centers are helping to protect, document, and effectively use these resources. Biodiversity conservation was the first component of Ethiopia-ICARDA collaboration three decades ago – and still remains a key element of partnerships. ICARDA's genebank contains almost 12,000 germplasm accessions from Ethiopia. These include a range of food and feed crops as well as wild crop relatives and progenitors. These genotypes were collected by Ethiopian research organizations, in partnership with ICARDA and many other centers. They are freely available to researchers worldwide. For example, about 13,000 samples have been shared with EIAR centers in the past 10 years, for use in breeding programs.



## Barley research

Collaborative research on barley began in 1984. Through the 80s and mid 90s, the program focused on Ethiopian landraces. More than 1200 landraces were tested in different environments, and improved selections were released for cultivation. The research program gradually expanded. The initial focus on food barley varieties for low-input dryland environments was broadened to include both food and malting barley varieties, for the entire range of production environments in Ethiopia. Simultaneously, greater emphasis was placed on new material developed at ICARDA through conventional hybridization and progeny selection.

Many of the varieties currently grown in Ethiopia were developed by EIAR-ICARDA collaboration. They include food barley varieties Shege, Abay, Misratch, Dimtu, Tilla, Bentu, Desta, HB 1307 and Diribe; and malting varieties HB 1533 and Kiflu-B. New lines continue to be developed and tested. For example, more than 800 ICARDA breeding lines were tested at the Holetta Research Station



*Participatory plant breeding: farmers are equal partners in experimental design and variety selection*

## New malting barley variety

Ethiopia imports more than 40,000 tons (two-thirds of total requirements) of malt barley each year, for use in food and beverages. This is set to change, following the release of a new variety known as Kiflu-B. Kiflu was released in 2006. Today it is the variety of choice for more than 35,000 farmers in the Ethiopian highlands, many of them growing it on contract for private breweries. According to EIAR, it is grown on at least 31,000 hectares.

The new variety was developed by ICARDA in the mid 1990s, and identified and released by the Holetta Agricultural Research Center. It yields 2.5 to 4.8 tons per hectare, and up to 7 tons in some fields. It is tolerant to lodging, resistant to at least five important plant diseases, and has excellent malting quality (seed size, protein content and other parameters). Adoption has been concentrated in the Arsi region, where the Asela malt factory – the main buyer – is located. EIAR scientists report considerable interest from farmers in the central and Bale highlands as well.

in 2009, with encouraging results in terms of agronomic type and disease resistance.

The barley program is also helping to introduce participatory plant breeding (PPB) methods, where farmers are genuine research partners, making decisions on germplasm selection, even on design and implementation of trials. A PPB program has been launched in the Tigray region, with some 250 farmers at 14 locations. New drought-tolerant varieties have been identified, and progeny from a crossing program are now being tested on farmers' fields. Another project led by the University of Norway is using molecular mapping techniques to study PPB crosses.

Future research will focus on both food and malting barley. Key priorities will be: technical support for national breeding and dissemination programs; and identification of germplasm to address the growing problems of drought, soil acidity and aluminum toxicity.

## Wheat: fighting a global threat

Ethiopia is a key partner in global efforts to fight Ug99 – a new race of wheat stem rust disease that is spreading rapidly, and could threaten wheat and barley production worldwide. An EIAR-ICARDA breeding program aims to halt a potential pandemic by providing emergency replacements for susceptible varieties, while developing new varieties with durable resistance. Over 10,000 genotypes – wild wheat, cultivated varieties, ‘retired’ varieties – have been screened in Debre Zeit, Melkassa and Kulumsa research centers, and 10-15% of them have shown adequate levels of resistance. DNA studies of the most promising lines are underway at ICARDA headquarters, aiming to identify and characterize novel resistance genes to develop new varieties.

EIAR, ICARDA and the Kenya Agricultural Research Institute have jointly established a ‘shuttle breeding’ program, under which genotypes are tested at ICARDA’s headquarters in Syria, at Ug99 ‘hot spots’ in Debre Zeit and Kulumsa; and in Njoro, Kenya. Flag 5, a high-yielding Ug99-resistant variety, was released in Ethiopia in 2009, and two more varieties are expected to be released shortly. Elite germplasm identified by the shuttle breeding program has also been distributed to plant breeders in more than 20 countries.



*Field trials at Debre Zeit: rust-resistant genotypes identified in Ethiopia are being used by breeding programs in several countries*

Another component is the establishment of 'trap nurseries' to track the spread of rust pathogens, assess whether resistance genes continue to be effective, and provide early warning of the development of new pathogen strains. Trap nurseries are being developed for three rust diseases – stripe, leaf and stem rust – and will be established at Debre Zeit, Kulumsa and other locations.

This research is complemented by an FAO-funded capacity development program that includes training courses, workshops and field tours on plant breeding methods, disease screening and monitoring, seed production and other areas.

## New varieties, new seed

With the first Ug99-resistant varieties becoming available, the next challenge is to ensure they are disseminated quickly. A new USAID-funded project aims to fast-track variety release and seed production, and establish demonstration trials to promote new varieties and improved crop management practices.

In 2009 and 2010, three new Ug99-resistant wheat varieties – Flag 5 from ICARDA and Kakaba and Danda'a from CIMMYT – were released in Ethiopia. EIAR has produced 72 tons of early-generation seed, from which certified seed is now being produced by the Ethiopian Seed Enterprise, Amhara Seed Enterprise, Oromia Seed Enterprise and the Arsi State Farm. About 870 tons of seed will be harvested in the coming season.

Five more rust-resistant wheat varieties are under final testing at Debre Zeit. The project has begun multiplying these varieties in advance, to speed up testing and dissemination. Twenty kilograms of 'nucleus' seed of each variety, produced at ICARDA headquarters, is being shipped to Ethiopia for multiplication by EIAR.

## Expanding faba bean cultivation

With help from multi-disciplinary EIAR-ICARDA teams, highland farmers in Ethiopia are beginning to cash in on the huge potential offered by faba bean. New high-yielding, disease-resistant varieties have been developed, together with improved production methods,

particularly for weed and pest management. Adoption is spreading. Production has increased by 47% between 2001/02 and 2006/07.

The collaborative research program began in the mid 1980s, when an ICARDA scientist was posted at the Holetta Research Center. The partnership continued to grow, leading to two major changes: an expanded breeding program, and a greater emphasis on on-farm testing.

Until the early 1990s, breeding programs in Ethiopia were based mainly on local landraces. The germplasm base has been considerably broadened with several thousand genotypes from ICARDA: breeding lines and other advanced material, segregating populations, and landrace accessions from different countries. This material was used to develop new high-yielding varieties. Shallo and BPL 18021-2 were released in 1999 and 2000. Both are resistant to the two major faba bean diseases, rust and chocolate spot. Holetta and Degaga, selected directly from ICARDA material, were released in 2001 and 2002. They are suited to well-drained soils in highland areas.

The next target is to expand faba bean cultivation in vertisol areas prone to waterlogging. Such areas cover 8 million hectares in Ethiopia. Traditional varieties are severely affected by excessive soil moisture and by root rot disease, which is common in waterlogged areas. Four new waterlogging-tolerant varieties (Moti, Gebelcho,



*On-farm trials  
of Walki: high  
yields even under  
waterlogged  
conditions*



Obsie and Walki) have been released in the past five years. All were developed at EIAR by crossing improved ICARDA lines with local landraces. Walki, for example, is tolerant to waterlogging, resistant to root rot, has a yield potential of 2.4 to 5.2 t/ha (compared to 1.2 t/ha from landraces) and seeds 70-100% larger than the standard varieties. Several other promising lines are being tested for potential release.

## Lentil: protein plus profits

Lentil yields in Ethiopia have been limited by waterlogging, plant diseases, frost, and by the phenology of traditional varieties. New EIAR-ICARDA varieties, when sown early using improved planting methods, yield six times as much as traditional landraces.

Research collaboration began in the early 1980s, when large numbers of ICARDA germplasm and breeding lines were shipped to EIAR stations for evaluation. The program soon expanded, to include breeding, agronomy and disease management research. The biggest challenge was the production environment. Lentil is grown mainly on highland vertisols that are prone to waterlogging. Traditional varieties are severely affected by the combination of excess moisture and plant diseases (mainly rust, wilt and root rot). The crop is therefore planted towards the end of the rainy season and relies mainly on residual soil moisture. The EIAR-ICARDA team



*Lentil variety Alemaya: high yield, wide adaptation, hugely popular with farmers*

developed disease-resistant, waterlogging-tolerant varieties; and adapted the ridge-and-furrow system to improve field drainage. With this, the new varieties could be planted at the beginning (not the end) of the rainy season, with far higher yields. Traditional varieties yield around 500 kg/ha, even in disease-free years. With proper management, the new varieties yield up to 3 t/ha.

To date, Ethiopia has released eleven improved lentil varieties, of which nine (Assano, Teshale, Alem Tena, Alemaya, Gudo, Ada'a, Chalew, Chekol and Derash) were derived from ICARDA material. Adaa and Alemaya are highly resistant to rust, wilt and root rot. Alemaya – the country's most popular variety – has unusually high 'plasticity', and can be grown in diverse environments, from hot, semi-arid areas to the cool, relatively wet highlands.

Between 2001/02 and 2007/08, national average lentil yield increased by 37%, and production rose from 38,000 tons to 94,000 tons. With assured, high-quality harvests, entrepreneurs have set up a large number of small-scale processing units in the Sendafa and Ginbichu areas, supplying decorticated (split) lentils to both domestic and export markets.

## Kabuli chickpea

Formerly, Ethiopia produced mainly small-seeded desi chickpeas. Large-seeded kabuli chickpeas, which offer higher yields and better prices, were usually ruled out because of their vulnerability to diseases. Not any longer. High-yielding kabuli varieties, resistant to multiple diseases, are now available, and adoption is growing rapidly. Between 2001/02 and 2007/08, chickpea yields increased by 30%, and production by nearly 60%. Between 2005 and 2008, chickpea exports grew nearly seven-fold.

Research collaboration began in the early 1980s. Joint evaluation of ICARDA breeding lines led to the release of four improved wilt-resistant kabuli varieties, targeted primarily at mid-altitude areas in the Shewa region. Improved production 'packages' were also developed, combining appropriate planting date, weed control, pest management and other practices to maximize yields from the new varieties.



*ICARDA's Tel Hadya station: low-cost, high-throughput methods to screen legume genotypes for heat and drought tolerance*

In recent years, research has focused on kabuli varieties for highland areas. Arerti, released in 2000, is resistant to fusarium wilt and ascochyta blight. It now accounts for the bulk of Ethiopia's chickpea exports. Three more varieties – Teji, Habru and Ejere – selected directly from ICARDA lines, were released in 2004 and 2005. They yield up to 4 t/ha, compared to 1 t/ha from landraces; and are resistant to ascochyta blight, wilt and root rot. They are large-seeded, fetching almost double the market price of traditional varieties. Crucially, they can be planted early, allowing the crop to make full use of available soil moisture.

Habru is now in its third year of dissemination, involving demonstration plots at Debre Zeit and on more than 200 farmers' fields in the East Shoa Zone (Oromia region). In 2009, these farmers produced 155 tons of different kabuli varieties. The national extension service is now linking farmers' unions, NGOs and public-sector seed programs to ensure rapid dissemination.

## Safe grasspea varieties

Grasspea (*Lathyrus sativus*) has been cultivated in Ethiopia for more than 2500 years. It is an exceptionally hardy crop – tolerant to both drought and waterlogging, resistant to several important diseases

– and rich in protein. In drought years, when other crops fail, grasspea can become the only source of food and animal feed for poor rural households. As a result, cultivation has expanded by 80% in the past ten years, and Ethiopia now produces almost 200,000 tons per year. Grasspea is also suitable for highland areas, where waterlogging (not drought) is a major problem. In these areas it is a potentially important cash crop, with a ready market and lower production costs than other legumes.

However, over-consumption of grasspea for a prolonged period can result in lathyrism – a disease that causes progressive paralysis of the lower limbs. Lathyrism is caused by a neurotoxin known as beta-ODAP (oxalyl di-aminopropionic acid), found in grasspea seeds. ICARDA scientists identified a number of genotypes with low toxin levels, safe for human consumption. With funding from the UK's Department for International Development, these genotypes were used to develop low- $\beta$ -ODAP, high-yielding varieties, which were then tested for multiple seasons at several research stations in Ethiopia.



*The new high-yielding, low-toxin varieties will help eliminate the risk of lathyrism*

Ethiopia's first safe grasspea variety, Wasie, was released in 2005. Wasie seeds contain less than 0.1%  $\beta$ -ODAP. When planted early, using the recommended agronomic practices, it almost completely eliminates the risk of lathyrism. Several other promising lines have been identified, and are being evaluated for  $\beta$ -ODAP content and stability, as well as yield and other performance traits.

The project team also tested ways to reduce toxin content to safe levels, even in local landraces. Simple, low-cost methods were identified: early sowing to avoid moisture stress, application of zinc sulfate fertilizer (to boost plant uptake of zinc, an essential micronutrient), and soaking grasspea seeds in water overnight before cooking.

## Understanding virus diseases

Farm surveys by EIAR-ICARDA teams helped fill a key information gap: lack of data on the incidence and relative importance of viruses infecting legume crops in Ethiopia. Surveys were conducted in 1998, 2003 and 2004. The first survey focused on chickpea and lentil in Shewa province; the second on faba bean and pea in the Amhara region; and the third on a range of legume crops in the Bale region.

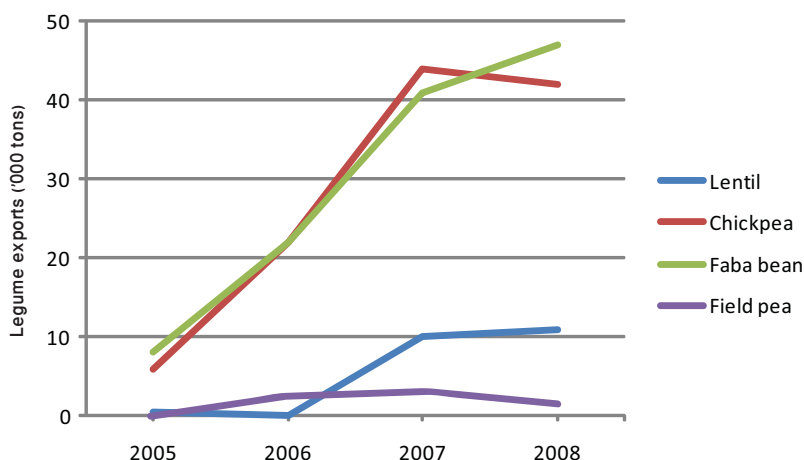
The surveys, which combined visual observations with laboratory analysis, highlighted the importance of lab testing. For want of resources, surveys in many developing countries often rely on visual observation alone. This can lead to severe under-estimates of disease incidence as well as mis-identification of viruses. The surveys also highlighted the importance of seed quality. For example, infection rates of one important disease ranged from zero to 58% in different lentil fields, depending on the quality of seed used by the farmer. This finding has encouraged seed multiplication organizations to play a greater role in preventing seed-borne diseases.

The major legume viruses are spread by aphids, whose population can fluctuate considerably from one year to the next, depending on environmental conditions. Future work will focus on what conditions favor the development and spread of aphids. This will link to other planned work on how climate change will alter the distribution and spread of insect pests.



## Ethiopia's export boom

Between 2001/02 and 2007/08, cultivation of food legumes – faba bean, chickpea, lentil, field pea, grasspea and others – expanded by 41%, and production by nearly two-thirds. Yields have increased by 30% in chickpea and field pea, and 37% in lentil. In 2008, Ethiopia exported more than 100,000 tons of legumes. Between 2005 and 2008, exports grew by more than 600% (see chart).



*The boom in legume exports has been driven by new, high-yielding varieties*

*Source: Ethiopian Revenue and Customs Authority, 2009*

## Watershed research

A new project for the Amhara region was launched in 2009, with funding from the Austrian Development Agency. The project, 'Unlocking the potential of rainfed agriculture' uses a community-led approach to validate and promote an integrated package of technologies for low-rainfall areas. Partners include EIAR, Amhara Regional Agricultural Research Institute, Gondar Research Center, Sasakawa Global 2000, and the University of Natural Resources and Applied Life Sciences (BOKU), Vienna.

The project is being implemented at a pilot watershed near Gondar in the northern Ethiopian highlands. The technology components include improved varieties and management methods, as well as more efficient, sustainable use of natural resources. The project will test and fine-tune methods for harvesting and using rainfall run-off to provide targeted irrigation during dry spells. Researchers will work with extension staff and communities in the watershed to trial improved varieties, soil erosion control measures, and improved agronomic practices such as broad-bed planting. They will also use quantitative biophysical models to simulate the effects of these technologies innovations on water and nutrient dynamics and soil erosion at watershed level.

This research will help answer several questions. What technologies are effective, profitable, ecologically sound and socially acceptable? What are the downstream impacts of these interventions? How best can they be scaled out to other areas with similar conditions?

The expected results: higher yields, better soil conservation, more sustainable resource use and improved livelihoods, The findings will also provide a better understanding of rainfed production systems, and the downstream or external impacts of technology interventions. Eventually, the project will serve as a platform for developing and disseminating new technologies for similar ecologies in other countries as well.



*Low-rainfall  
areas have high  
potential, if the right  
technologies are  
used*

## Livestock: improving local breeds

Ethiopia has a rich diversity of indigenous sheep breeds and ecotypes, reared in different environments from the mountainous highlands to arid pastoral lowlands. Nine indigenous breeds have been identified through phenotypic and molecular characterization. A project funded by the Austrian Development Agency is helping to protect this unique gene pool. It focuses on four sheep breeds – Horro, Menz, Bonga and Afar – in eight communities located in four contrasting environments. About 500 households and 10,000 sheep are involved. The aim is to develop a pool of improved breeding animals, boost animal health and productivity and create better market opportunities for small-scale livestock producers. The project partners include EIAR, three Regional Agricultural Research Institutes (Amhara, Oromia and Southern), ICARDA, BOKU University in Vienna, and the International Livestock Research Institute.

The project is developing community-based breeding programs, in which farmers themselves decide breeding objectives, strategies and institutional structures. Project scientists used a simulation model to predict the likely genetic and economic gains for various breeding options, allowing livestock owners to make informed decisions on flock management. Thanks to the project, these communities now have – for the first time – detailed records of birth dates, litter size and liveweights of individual ear-tagged animals. In spring and summer 2010 the project team evaluated the first two sets of candidate rams from the breeding program and purchased the best animals, to be shared by the community. The project has also introduced treatments for diseases and intestinal worms, and trained owners on animal health, feeding regimes and production of forage crops.

This research has led to a clear understanding of market access constraints in remote communities, and what institutional arrangements are needed. The results – with inputs from livestock experts involved in similar programs elsewhere – are being used to develop guidelines for community-based breeding programs for sheep and goats in other countries.



*Prize sheep, proud owners. Winner of a project evaluation to select the best animals for a community-based breeding program*

## Capacity development

Capacity development is a central component of the Ethiopia-ICARDA partnership. The aim is to help strengthen the skills of researchers, extension staff and farmers, through a variety of training programs. These include classroom courses and hands-on field training for extension staff; field days, field schools and other training programs for farmers. For researchers, ICARDA offers short-term courses on specific subjects; individual long-term training (typically 6 to 12 months); fellowships and Visiting Scientist positions; and co-supervision of MSc and PhD students, jointly with universities in Ethiopia and elsewhere. These programs are implemented through a formal agreement with the Ministry of Agriculture and Rural Development.

Training programs are conducted within Ethiopia, at ICARDA's headquarters in Syria, or in partner countries. The courses cover a range of subjects: biodiversity conservation, plant breeding, biotechnology, crop management (agronomy, pathology, entomology, virology), seed science, water and soil management, livestock (breeding, production, health, value addition) and social sciences.

Since 1979, more than 700 Ethiopian researchers have benefited from training programs organized by ICARDA. They include 20 EIAR staff who completed their MSc or PhD research, with field work conducted within ICARDA research programs.

*Ethiopian participants in ICARDA training programs, 1979-2009*

	Participants
Long-term group courses in Syria (4-6 months)	34
Short-term group courses in Syria (2-4 weeks)	102
Short term group courses in other countries (2-4 weeks)	463
Fellowships (non-degree)	104
Post-graduate studies (MSc, PhD)	20
<b>Total</b>	<b>723</b>



*Managing legume diseases: traveling workshops help build capacity among scientists, extension staff and farmers*



## Bigger harvests, higher incomes

In 2003, ICARDA and its partners launched an IFAD-funded project to develop improved technologies for four major food crops (wheat, faba bean, chickpea, lentil) in four countries – Egypt, Ethiopia, Sudan and Yemen. The project introduced a number of technology ‘packages’, each consisting of an improved crop variety together with recommended crop management methods. Packages for Ethiopia included

- Faba bean varieties Mesay and Degaga
- Chickpea varieties Arerti and Shasho
- Lentil variety Alemaya

A detailed impact assessment was conducted in 2005/06, to assess project impacts on income and livelihoods; better understand adoption patterns and trends; and identify the technical, socioeconomic and policy constraints that hinder wider adoption of improved technologies. Over 900 households in the four countries were interviewed. Here we summarize the data from Ethiopia, obtained from 198 households from five districts in the Arsi and East Shewa regions.

***Adoption of new technologies.*** Adoption rates for new varieties varied by crop and by region, but were generally high: on average, 71% for faba bean, 67% for chickpea and 36% for lentil. Adoption of other components of the package was more variable (Fig 1).

***Crop yields.*** The complete package (variety + management) offered the highest yield gains. But farmers also reported significant yield gains from individual components in the package (Fig 2), in nearly all crops and technology components.

***Food security.*** Food security was measured in terms of per capita grain harvest, i.e. quantity harvested by the household, divided by family size. Faba bean technology adopters obtained an average per capita harvest of 61 kg, 39% higher than non-adopters.

***Household income.*** Adopters earned 17% higher net returns than non-adopters. Adopters reported net returns per hectare of US\$ 451 in lentil and US\$ 551 in chickpea.

Figure 1. Adoption rate of faba bean technologies (% of farmers)

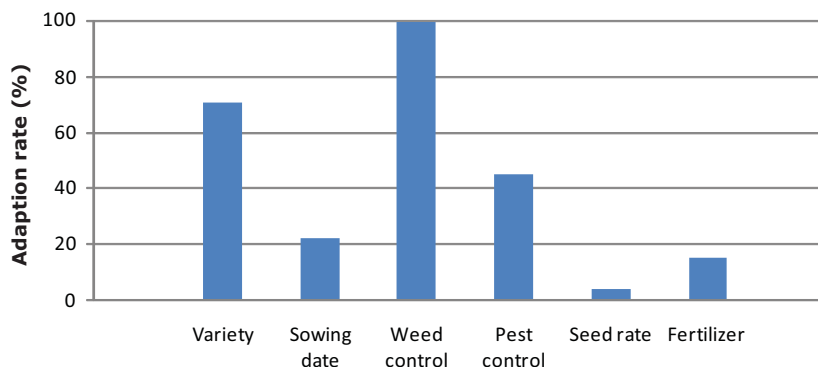
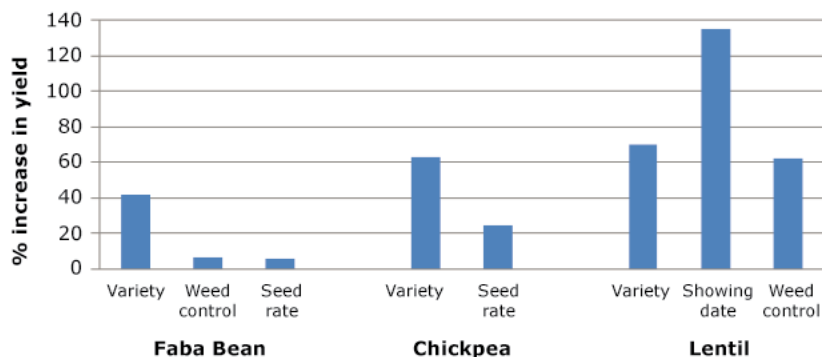


Figure 2. Yield gains (% increase, adopters vs non-adopters)



EIAR-ICARDA collaboration has led to the release at least 50 new high-yielding crop varieties, with many more in the pipeline.

“For the first time in my life, I have money in my bank account,” said one farmer, who works with EIAR-ICARDA researchers to test new chickpea and lentil varieties. He has banked 32,000 birr, equivalent to about US\$ 2500.

## Future plans

Ethiopia will continue to be a focus for international research-for-development, and will play a major role in the CGIAR's new Consortium Research Programs.

EIAR and ICARDA are working with other stakeholders to identify priorities for the future. One key objective is to strengthen the ability of smallholder farmers to cope with climate change. A new project funded by the World Bank through ASARECA targets Ethiopia, Kenya, Madagascar and Rwanda. It focuses on water – the limiting constraint in most dry areas. The project will help disseminate technologies to enhance water productivity; and integrate these with other technologies (varieties, crop and soil management) for maximum impact. It will also help strengthen market linkages and institutional and policy support for smallholder agriculture. Research in Ethiopia will be conducted in the 1800-hectare Jogo-Gudedo watershed in the central Rift Valley.

An IFAD-funded project will target small-scale crop and livestock producers in Ethiopia, Egypt, Eritrea, Sudan and Yemen. It aims to identify technical, institutional and policy options for crop-livestock systems, build R&D networks, introduce new tools for extension, and strengthen national R&D capacity. Technologies will be validated at pilot sites and then scaled out to similar ecologies in other countries. Implementation of both projects will begin in 2011.

Another project, launched in 2010, is funded by the Gates Foundation through Bioversity International. The objectives are to update the database on crop varieties released in Ethiopia; conduct a nationwide survey of variety adoption; and analyze the factors influencing technology diffusion. The results will help better target research and extension efforts, and inform the development of agricultural policy in Ethiopia. The first phase is progressing well, and the adoption survey is scheduled for early 2011.

Several other projects are being developed, or are awaiting approval from funding agencies. These include commodity-oriented research with two broad objectives: bridging the gap between potential and actual yields through more effective dissemination, and expanding cultivation of appropriate crops by addressing specific production

constraints in each agro-ecosystem. For food legumes, for example, new projects will use a shuttle breeding approach to develop varieties adapted to drought-prone environments. The partners include research and extension centers, seed production agencies and others.

Smallholder farmers in Ethiopia already face a number of challenges. New problems are emerging as a result of external factors such as climate change and global competition. But three decades of research have built a solid foundation. Ethiopia-ICARDA partnerships will continue to build on this foundation to deliver appropriate, effective technologies for smallholder agriculture.

## About ICARDA and the CGIAR



Established in 1977, the International Center for Agricultural Research in the Dry Areas (ICARDA) is one of 15 centers supported by the CGIAR. ICARDA's mission is to contribute to the improvement of livelihoods of the resource-poor through research and partnerships to improve agricultural productivity, food security, farm income and livelihoods, while ensuring sustainable, equitable use of natural resources. ICARDA has a global mandate for the improvement of barley, lentil and faba bean, and serves the non-tropical dry areas for the improvement of on-farm water use efficiency, rangeland and small-ruminant production. In the Central and West Asia and North Africa (CWANA) region, ICARDA works on bread and durum wheats, kabuli chickpea, pasture and forage legumes, and associated farming systems. Research also includes land management, diversification of production systems, and value-added crop and livestock products. Social, economic and policy research is an integral component, helping to better target poverty and to enhance the uptake and maximize impact of research outputs.



The Consultative Group on International Agricultural Research (CGIAR) is a strategic alliance of countries, international and regional organizations, and private foundations supporting 15 international centers that work with national agricultural research systems and civil society organizations including the private sector. The alliance mobilizes agricultural science to reduce poverty, foster human well being, promote agricultural growth and protect the environment. The CGIAR generates global public goods that are available to all. The World Bank, the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme, and the International Fund for Agricultural Development are cosponsors of the CGIAR. The World Bank provides the CGIAR with a System Office in Washington, DC. A Science Council, with its Secretariat at FAO in Rome, assists in the development of CGIAR research programs.

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