ICARDA
Caravan
Issue No. 22, June 2005

Review of agriculture in the dry areas

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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 improve the welfare of poor people through research and training in dry areas of the developing world, by increasing the production, productivity and nutritional quality of food, while preserving and enhancing the natural resource base.

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

The Consultative Group on International Agricultural Research (CGIAR) is a strategic alliance of countries, international and regional organizations, and private foundations supporting 15 international agricultural research 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 (UNDP), and the International Fund for Agricultural Development (IFAD) 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 the System in the development of its research program.

Cover Photo: The ultimate objective of ICARDA's work is to improve food production to alleviate hunger and poverty in the poorer sections of the communities in the dry areas. ICARDA works to improve small ruminant production systems through research on alternative feed sources, rangeland productivity, and market options for livestock products to enable the poor to increase their incomes.

Editor-in-Chief
Surendra Varma
(S.Varma@cgiar.org)

Editors
Ronald Kayanja
Swathi Sridharan

Design
George Chouha

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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.org

From the Director General

The Central and West Asia and North Africa (CWANA) region is characterized by a high population growth rate, low and erratic rainfall, limited arable land, and scarce water resources. The region is the second poorest in the world, with about 150 million people or 20% of the population living on less than one dollar a day. Poverty is more severe in the low-income countries such as Djibouti, Ethiopia, Mauritania, Pakistan, Somalia, Sudan, Tajikistan, Turkmenistan, Uzbekistan, and Yemen. Most of the poor in this region live in rural areas and depend on agriculture for their livelihood.

Since time immemorial, livestock production has been a key source of livelihoods for most of the rural communities in CWANA. The region has the world's largest contiguous area of rangelands, about 828 million hectares in West Asia and North Africa and 260 million hectares in Central Asia.

Rapid population growth on the one hand, and increased affluence in some parts of the region on the other, especially in the Gulf countries, are contributing to a sharp increase in demand for livestock products. Meat imports are expected to increase from 0.946 million tons in 1997 to 1.767 million tons in 2020. Net imports of sheep and goat milk, and poultry eggs, are also expected to increase sharply in the years to come.

The increased demand for livestock products should be good news for the small producers whose livelihoods depend on crop and livestock production systems. However, studies by ICARDA researchers indicate that the small producers must overcome several obstacles before they can reap benefits from the ever-increasing demand for livestock products. These include improvements in productivity, value addition, marketing and sustaining the natural resource base.

In West Asia and North Africa (WANA), the major challenge to livestock production is the dwindling feed sources. The increase in small ruminant numbers is subjecting the already degraded rangelands to further degradation, and farmers are facing an acute shortage of feed. To support resource-poor farmers, therefore, there is an urgent need to both regenerate the rangelands and provide alternative sources of low-cost feed, such as cactus and feed blocks made from agricultural by-products.

Another challenge facing small producers in WANA is linking themselves to the changing markets. Productivity improvements alone are not enough to sustain their livelihoods if their products cannot compete in the marketplace. ICARDA researchers are working with national programs and producers to enable them identify low-cost value additions to process their livestock products and improve the quality of their outputs to enable them to meet consumer tastes and compete in the market. Linking farmers to markets is a key pathway to escape from poverty.

In Central Asia, challenges to livestock production are different. The collapse of the Soviet Union brought about a disruption of the production and marketing systems, with an overall effect of huge reductions in livestock numbers, reaching 70% in some countries. The former state-owned large farms and cooperatives, which had an assured market within the Soviet Union, have been replaced by smallholder production enterprises. Though the region has vast rangelands, the smallholder enterprises have limited capacity to utilize the distant range and are compelled to have their animals graze the nearby village rangelands, leaving the bigger range underutilized. The agricultural research system is also undergoing reorientation in response to the emerging market-based economy. Many challenges still remain, and ICARDA is working with NARS in Central Asia to develop viable solutions.

This issue of Caravan provides examples of ICARDA's work with its partners to help ensure sustainability of livelihoods for the poor in marginal areas. The focus of our research goes beyond production options to diversification and markets, reflected in our new programmatic structure which we implemented starting January 2005. Our research portfolio is now reorganized into six mega-projects, namely, management of scarce water resources; agrobiodiversity conservation and germplasm improvement; combating desertification; the diversification of rural livelihoods; poverty and livelihoods analysis; and knowledge management and dissemination. In addition, emphasis is being placed on improved income generation from high value crops and by adding value to staple crop and livestock products; rehabilitating agriculture in conflict/post-conflict situations; and closer alignment of agricultural research with mainstream development programs through research for development applications.

ICARDA strongly believes that working in partnership with national programs, regional and international agricultural research institutions and other stakeholders, the Center can help the countries in CWANA and other dry areas of the world meet the Millennium Development Goals related to agriculture and poverty alleviation.

Prof. Dr Adel El-Beltagy
Director General

ICARDA Celebrates Presentation Day 2005

"You are going on a journey to look at the problems of people living in drylands and some of the solutions that the ICARDA family can offer," said Dr Margaret Catley-Carlson, ICARDA Board Chair, in her welcome address to the distinguished guests at the Center's Presentation Day on 1 May 2005. ICARDA's annual Presentation Day brings ministers, ambassadors and other senior officials from embassies in Damascus, leaders of national programs, donor and media representatives and other friends of the Center to receive an update on ICARDA's progress during the year.

Among the distinguished guests present at ICARDA's Presentation Day were (right to left): H.E. Dr Adel Safar, Minister of Agriculture and Agrarian Reform, Syria; H.E. Dr Yousef Abu Safieh, Minister of Environment, Palestine; H.E. Dr Sawsan Al-Sherifi, Minister of Agriculture, Iraq; Prof. Dr Iwao Kobori, United Nations University, Japan, and former Vice-Chair of ICARDA Board of Trustees; and Dr Tom Lumpkin, Director General, the World Vegetable Center, Taiwan.

Dr Catley-Carlson said that ICARDA's work is multifaceted and not very easy to understand because some of the research is on crops in the Central and West Asia and North Africa (CWANA) region, while other research focuses on crops grown in dry areas around the world. She pointed out the challenges to agricultural research in conflict and post-conflict regions, saying that research capacities are often shattered by conflict. ICARDA has been at the forefront in the CGIAR efforts to examine the issue of rebuilding agriculture in conflict-ridden areas, she said.

Dr Catley-Carlson thanked ICARDA's donors for their continued support that enables the Center to fulfill its mission. "If we didn't have those that express their confidence in ICARDA through financial contributions, the Center would not be working," she said. Dr Catley-Carlson also thanked the Government of Syria for not only hosting the Center, but also for providing it with continued support.

Prof. Dr Adel El-Beltagy, ICARDA Director General, welcomed the guests and presented an overview of the challenges facing dryland agriculture and how ICARDA is addressing them in collaboration with its partners to improve livelihoods of the poor through agricultural research. He emphasized that poverty in the dry areas of CWANA, if not addressed, will lead to other challenges within the region and beyond. "Recent figures from UNDP indicate that WANA is the second poorest region after Sub-Saharan Africa," he observed. He called for a comprehensive approach to address the problems of poverty in the region.

Dr Margaret Catley-Carlson
ICARDA Board-Chair

Prof. Dr Adel El-Beltagy
ICARDA DG

Dr Hans van Ginkel
Rector, UNU

The Director General pointed out that ICARDA is seeking to develop a better understanding of rural livelihood strategies through studies of constraints and opportunities, sources of income, access to assets, social and human capital and markets and other institutional infrastructure. "The objective is to provide options for improving the livelihoods of the rural poor through appropriate pro-poor technologies," he said.

Prof. Dr El-Beltagy thanked all donors to ICARDA for their continued support. He expressed special thanks to the people of Aleppo for their hospitality and to the Government of the Syrian Arab Republic for its continued generous support to the Center.

A keynote presentation was made by Dr Hans van Ginkel, Rector of the United Nations University, Tokyo, Japan on "Preparing for Complexity: Water Management and Agro-biotechnology in an Increasingly Complex World." Giving the example of water management experiences in the Netherlands, Dr van Ginkel explained the importance of using new tools of science to manage water resources while protecting the environment.

Afghanistan Minister of Agriculture Launches "Healing Wounds"

H.E. Mr Obaidullah Ramin, Afghanistan Minister of Agriculture, Animal Husbandry and Food, launched "Healing Wounds" on 24 February 2005 in Kabul.

Healing Wounds is the product of a study of the role of the CGIAR centers in rebuilding agriculture across Central and West Asia and North Africa (CWANA), Asia, sub-Saharan Africa, Latin America and the Pacific, led by Dr S. Varma, Head of Communication, ICARDA, on behalf of the Marketing Group of the CGIAR. The report was produced at ICARDA and published by the CGIAR.

"The Government of Afghanistan is happy that the CGIAR and Future Harvest Consortium to Rebuild Agriculture in Afghanistan (FHCRAA) chose Kabul for the main launch of Healing Wounds," said Minister Ramin. "I will personally present a copy of Healing Wounds to President Hamid Karzai, who is currently on a diplomatic mission to India."

The Minister said that more than 80% of the population in Afghanistan derives its livelihood from agriculture. Therefore, improvements in agriculture from seed production to infrastructure to markets can greatly contribute to the economy, stability and prosperity of the country. "We are happy to see the active involvement of the CGIAR centers in agricultural research and development in Afghanistan," he said.

On behalf of the 15 CGIAR centers, Prof. Dr Adel El-Beltagy, Director General of ICARDA, thanked President Karzai and Minister Ramin for their support to the work of ICARDA and other CGIAR centers in Afghanistan.

He explained the genesis and significance of Healing Wounds and presented examples of the work of the CGIAR Centers in Afghanistan, Iraq, Palestine, and other countries affected by conflict and natural disasters elsewhere in the world. "Healing Wounds consolidates the information from the CGIAR centers on rebuilding agriculture. The case studies covered in the report were analyzed to draw lessons that could be used to make the partnerships between research and aid organizations more efficient," he said.

"The on-going events of destruction demand a global alliance to improve the lives of people by bringing them justice, equality, food security and long-term peace. The scientific community has a great responsibility to work in a unified way so that the physical, biological, behavioral, and social sciences can address these profound and pervasive problems. Healing Wounds presents examples of such efforts," said Prof. El-Beltagy.

H.E. Mohamed Sharif, Deputy Minister of Agriculture, Afghanistan, also attended the launch ceremony and addressed the media. Those who were interviewed by the media included Minister Ramin; Deputy Minister Sharif; ICARDA DG Prof. El-Beltagy; senior author of the report Dr S. Varma; Vice Chancellor of Texas A&M University Dr Price; and CIP, CIMMYT and IPGRI representatives.

Aid organizations and development partners including the Department for International Development of the United Kingdom (DFID); the United States Agency for International Development (USAID); Japan International Cooperation Agency (JICA); the United Nations Food and Agriculture Organization (FAO); Texas A&M University; DACAAR; IFDC; Ministry of Agriculture, Afghanistan; Mercy Corps; as well as representatives from ICARDA, CIMMYT, CIP, IPGRI, and AVRDC attended the launch ceremony.

Media representatives present on the occasion included those from BBC Radio; BBC Uzbeki; Free Radio Europe (Azadi Radio); Al-Jazeera, TV; Radio Tehran; Chinese News Agency; Internews, Afghanistan; Voice of America; Pazwak News Agency; Afghan Voice Agency; Hewad Daily; Radio and TV Afghanistan; Youth Voice TV; Feefa News Agency; Hindokush News Agency; Pukhlayna Magazine; Women TV and Radio; Sobat Weekly; Kabul Times; Mashhad Radio and TV; Omaid Magazine; Abu Dhabi TV; Bakhtar News Agency; and Good Morning Afghanistan Radio.

H.E. Mr Obaidullah Ramin (center), Afghanistan Minister of Agriculture, Animal Husbandry and Food, along with Prof. Dr Adel El-Beltagy (right), ICARDA Director General, and Dr Serge Verniau (left), FAO Representative in Afghanistan, launched "Healing Wounds" in Kabul on 24 February 2005.

President of Turkmenistan Lauds Collaboration with ICARDA

The Eighth ICARDA-CAC Regional Coordination Meeting was held in Ashgabat, Turkmenistan, on 1-4 March 2005. The inaugural session was co-chaired by Prof. Dr Adel El-Beltagy, Director General of ICARDA, and H.E. Mr Begench Atamuradov, Minister of Agriculture, Turkmenistan. H.E. Mr Rejep Saparov, Head of the Office of the President of Turkmenistan, was the chief guest.

In a message to the participants, delivered by H.E. Mr Atamuradov, H.E. Saparmurat Turkmenbashi the Great, President of Turkmenistan, appreciated the on-going collaboration between ICARDA and Turkmen agricultural scientists, especially in germplasm improvement, soil and water management, and conservation of genetic resources. The President emphasized that, as a result of the collaboration between ICARDA and Turkmenistan, the country was seeing considerable progress in varietal improvement of wheat and other agricultural crops and development of sustainable crop production technologies, including those for growing fodder crops on saline soils.

Prof. Dr El-Beltagy greeted the participants and said that he was pleased that the year 2005 marked a decade of partnership between NARS of the CAC region and ICARDA. He highlighted the major milestones of the ICARDA-CAC collaboration in various areas of agricultural research and human resource development.

More than 50 participants attended the meeting, including the Heads of NARS from the CAC region, ICARDA scientists, representatives of ADB, as well as Turkmen scientists, involved in the collaborative program with ICARDA. The Heads of NARS presented their respective country reports on the progress made during the 2004/05 cropping season. They were particularly appreciative of ICARDA's support in human resource development, stressing the importance of both specialized and English language training courses for the scientists of the region.

On 1 March 2005, Prof. Dr Adel El-Beltagy (right), ICARDA DG, and H.E. Mr Begench Atamuradov, Minister of Agriculture, Turkmenistan, jointly opened the Turkmen National Genebank, housed at the newly constructed National Museum of White Wheat.

And briefly...

Short-term Training Course in Eritrea

ICARDA and the National Agricultural Research Institute (NARI) in Eritrea jointly organized a short-term training course in February on 'Experimental Design, Data Collection and Statistical Analysis." Through lectures and practical sessions, the 20 participants learned to use many of ICARDA's Online BioComputing programs.

Sustainable Agricultural Development

More than 120 farmers, researchers, policy makers, development workers and extension officers participated in the 'Sustainable Agricultural Development for Marginal Dry Areas Workshop,' held at ICARDA in January. Participants discussed the lessons learned from ICARDA's work in the Khanasser Valley, Syria, and aimed to improve understanding among the stakeholder groups and evaluate innovations for marginal environments.

Addressing Water Issues

The first meeting of the Arab Water Council's (AWC) Fundamental Committee was hosted by the UAE in Dubai, 3-5 January. Ministers, experts, and NGO and private-sector representatives working on water issues from 12 Arab countries discussed water issues in the Arab world and potential solutions. ICARDA is a founding member of the AWC and Prof. Dr Adel El-Beltagy, ICARDA DG, represented the Center at the meeting.

Promoting Olive in Dry Areas

An expert meeting on the potential and risks of growing olive in the marginal dry areas was held in March at ICARDA headquarters. Farmers, scientists, and NGO and the private sector representatives discussed the feasibility of growing olives in the dry areas and to design a set of guidelines for farmers to follow.

Lentil Research Benefits Nepal's Farmers

Farmers selecting elite lentil lines in Rampur, Chitwan district, Nepal.

Lentil production and productivity in Nepal has significantly increased in the last 15 years, contributing to food security in the country as well as income generation for many small-scale farmers, agro-industries, traders, and exporters. Total lentil production in Nepal has risen from 63,000 tonnes in 1986 to 150,000 tonnes in 2003. Its productivity has increased from 593 kg/ha in 1986 to 818 kg/ha in 2003. According to Mr R.K. Neupane, the Ex-Coordinator of the Grain Legume Improvement Program (GLIP) of the Nepal Agricultural Research Council (NARC), the country has produced a cumulative amount of more than 13,000 tonnes of lentil worth US$ 45 million over the 1995/96 to the 2002/03 cropping seasons.

In a recent meeting with Dr Ashutosh Sarker, ICARDA Lentil Breeder, Mr Neupane expressed deep gratitude on behalf of NARC to Prof. Dr Adel El-Beltagy, DG, and Dr William Erskine, ADG (Research), for ICARDA's continuous support to the Nepalese farmers. ICARDA has been working with GLIP since the early 1980s and has provided genetic materials, technical backstopping, human resources development, and financial support for research and development through external funding.

Mr Neupane said that some of the newly-released varieties, originating from ICARDA-supplied germplasm, have been adopted by the farmers in Terai and mid-hills, where there was no lentil earlier. Two recently-released varieties, 'Shekar' and 'Sital,' yield around 1.2-1.5 t/ha and are preferred by farmers for their large seeds and resistance to wilt root-rot complex. Many elite lines selected from ICARDA international nurseries are awaiting release for different agro-ecological niches. Examples of these include ILL 7723, ILL 6829, and ILL 7982 which yield around 1.9-2.9 t/ha and are resistant to multiple diseases.

Mr Neupane also appreciated ICARDA's technology transfer activities that follow a participatory approach. With the development and adoption of more new technologies, lentil cultivation should get a further boost in Nepal.

And briefly...

Syrian Ministry Officials Visit ICARDA

Three officials from the National Agricultural Policy Center (NAPC) of the Agricultural Ministry, Syria, visited ICARDA's Poverty and Livelihood Analysis Mega-Project in March to discuss potential collaboration in poverty research, gender issues, and rural migration, with the socioeconomics team of the Center.

APRP Coordination and Steering Committee Meeting

The Regional Technical Coordination Meeting of the Arabian Peninsula Regional Program (APRP) was held in the Sultanate of Oman in February. The meeting was inaugurated under the patronage of H.E. Khalfan Ben Saleh Al-Naibi, Under Secretary, Ministry of Agriculture and Fisheries, Oman, and participants from research institutes in Bahrain, Emirates, Kuwait, Oman, Qatar, Saudi Arabia and Yemen attended the meeting.

First RALF Workshop

The first Research in Alternative Livelihoods Fund (RALF) workshop was held in Kabul in April. Representatives from all 11 on-going projects were present. RALF is a competitive grant mechanism, managed by ICARDA and funded by the UK's Department for International Development (DFID), with the aim of providing farmers in Afghanistan with alternatives to growing opium poppy.

BBC Films ICARDA's Work

A BBC Journalist visited ICARDA in May to film the Center's work on Sunn pest. Prof. Dr Adel El-Beltagy, ICARDA DG; Dr Mustapha El-Bohssini, the IPM and Sunn pest research coordinator, and Dr Aden Aw-Hassan, Agricultural Economist, were interviewed for the program. The Center's work will be featured on a BBC program viewed by 270 million households worldwide.

ICARDA Office Inaugurated in Pakistan

ICARDA recently established a country office in Islamabad, Pakistan, to further strengthen the Center's long-standing partnership with the country and fulfill its commitment to improve productivity of crops and livestock, and alleviate rural poverty in the dry areas.

The new office was inaugurated by H.E. Mr Sikandar Hayat Khan Bosan, Federal Minister of Food, Agriculture and Livestock, Pakistan, and Prof. Dr Adel El-Beltagy, ICARDA DG, on 8 November 2004. "ICARDA has rendered incredible services in agricultural research in dry and arid areas. This is a big opportunity for Pakistan to benefit from the research and expertise of ICARDA in a broader sphere. I am sure the establishment of an ICARDA office in Pakistan will go a long way in promoting cooperation between ICARDA and Pakistan," H.E. Mr Bosan said.

Prof. Dr Adel El-Beltagy described the Center's work with Pakistan as an integral part of ICARDA's eco-geographic mandate. "ICARDA has developed a close relationship with the national agricultural research and development programs in Pakistan. This country office represents a new milestone that has been reached in achieving our common goal of creating sustainable livelihood options for the drylands," he said.

The new country office will enjoy the same privileges as other UN organizations and will facilitate the smooth implementation of ICARDA's research and development activities in Pakistan.

Prof. Dr Adel El-Beltagy unveiling the foundation plaque during the inauguration of ICARDA's country office in Pakistan. Looking on (left to right): H.E. Mr Sikandar Hayat Khan Bosan, Federal Minister of Food, Agriculture and Livestock; Dr Badaruddin Somroo, Chairman, PARC; Mr Mumtaz Ahmed, Additional Secretary, Ministry of Food, Agriculture and Livestock, Pakistan; and Dr Adel Aboul Naga, Senior Advisor to the DG, ICARDA.

And briefly...

Visitors from Iran

The Poverty and Livelihoods Analysis Mega-Project (MP5) at ICARDA hosted six visitors from Iran in February. The visit was designed to expose the Iranian farmers and extensionists to ICARDA's experience in analyzing farm survey data; and research in crop improvement, natural resource management, and socioeconomics.

'ICARDA Day' in Egypt

ICARDA and the Faculty of Agriculture, Ain Shams University, Cairo, jointly organized an 'ICARDA Day' at the campus of the University in April. A delegation from ICARDA, led by Prof. Dr Adel El-Beltagy, ICARDA DG, made presentations on various research activities and acheivements of the Center. More than 20 posters on ICARDA's research were also displayed.

Steering Committee Meeting for CAC

The eighth meeting of the Steering Committee of the CGIAR Eco-regional Program for Sustainable Agriculture in Central Asia and the Caucasus (CAC) was held at ICARDA in May. More than 50 scientists from the eight CAC countries, the CG Centers, and other international centers participating in the program attended the meeting. The participants presented country status reports and discussed ongoing collaborative activities with the various CG Centers.

ICARDA at UNCCD Meeting

ICARDA, through the consortium on Desertification, Drought, Poverty and Agriculture (DDPA), with ICRISAT, presented posters and a state-of-the-art review paper, and participated in two open panel discussions at the 3rd Meeting of the Committee to Review the Implementation of the Convention (CRIC3) of the UN Convention to Combat Desertification, held in Germany in May.

New, Low-Neurotoxin Grass Pea Variety Breaks the Fear of Paralysis in Ethiopia

The Ethiopian Agricultural Research Organization (EARO), in April, announced the release of its first low-neurotoxin variety of grass pea, safe for human consumption. Dr Seid Kamal, Head, Crops Section, EARO, sent this good news to Dr Ali Abd El-Moneim, Senior Forage Breeder, ICARDA. "The new variety has broken the fear of paralysis among Ethiopians," he said.

The new variety, 'Wasie,' is derived from grass pea germplasm supplied to EARO in 1999/2000 as International Lathyrus Adaptation Trials (ILAT). 'Wasie' yields 1.67 t/ha without any inputs, is moderately resistant to powdery mildew disease, and matures earlier than local varieties. The variety's low neurotoxin content (0.08%), compared with 0.4% in the local check, will reduce the number of lathyrism cases, an irreversible paralysis of the lower limbs that occurs when grass pea is consumed as a major portion of the diet over a 3- to 4-month period. The variety is recommended for cultivation in mid- to high-altitude areas (1700-2800 m.a.s.l).

ICARDA would like to congratulate EARO scientists involved in grass pea improvement for their dedication and hard work that led to the release of 'Wasie.'

The release of 'Wasie' grass pea variety is a breakthrough in helping the poor who rely on this crop as their key source of dietary protein, not only in Ethiopia but also in other grass pea growing countries (Bangladesh, China, Eritrea, India, Nepal, and Pakistan).

ICARDA and Ethiopian researchers discuss the performance of improved grass pea lines with farmers in Ethiopia.

And briefly...

Water Resources Management

ICARDA and the National Agricultural Research Institute (INRA), Morocco, organized a regional workshop in Rabat on 6-10 January to enhance the quality of data analysis and develop a research framework for the Center's regional project that aims to promote efficient use of scarce water resources to produce more food for a given amount of water.

Seed Health Testing in Afghanistan

To contine efforts to provide Afghan farmers with healthy seed of improved varieties, ICARDA and FAO jointly organized a training course on 'Seed Health Testing' in March in Kabul. The course covered aspects of quarantine, and detection and control of seed-borne fungal, bacterial, viral and nematode diseases.

International Conference on Agrobiodiversity

More than 137 scientists and project managers from around the world participated in the international conference on 'Promoting Community-driven Conservation and Sustainable Use of Dryland Agriobiodiversity,' held at ICARDA headquarters in April. The conference was aimed at exchanging experiences and developing community-based approaches to agrobiodiversity conservation. The program included 66 oral presentations and 70 posters.

Memorandum of Agreement

ICARDA and the Japanese International Cooperation Agency (JICA) signed a Memorandum of Agreement in May for a five-year JICA-supported Third Country Program for human resource development in Iraq, Syria, and other CWANA countries. The project supports three training courses each year on water management, integrated crop and livestock production, and agricultural biotechnology.

Remembering Prof. Dr Mervat El-Badawy

The ICARDA family was deeply grieved to receive the sad news that Prof. Dr Mervat El-Badawy, Director of the Technical Department at the Arab Fund for Economic and Social Development (AFESD), passed away on Tuesday, 23 November 2004 in Cairo.

Dr El-Badawy was a distinguished scientist, research manager and policy-maker, and had a long and close association with ICARDA and the CGIAR family. She served on the ICARDA Board of Trustees from 1991 to 1997, during which period she also served on the Board's Executive and Nomination committees. She was a member of the CGIAR Oversight Committee during 1997-2000. Since 1997, Dr Badawy had represented AFESD and the West Asia and North Africa (WANA) region at the CGIAR meetings.

A highly educated individual, Dr El-Badawy earned two doctorates from the University of Paris, one in Economics and another in Engineering. She also earned two MSc degrees, one in Computer Science and another in Mathematical Economics and Econometrics. She distinguished herself as an academician of the first rank at the University of Paris-Sorbonne. Dr El-Badawy rose from lecturer in 1971 to full professor by 1976, teaching at the graduate and undergraduate levels. She was awarded the Prix de l'Etat en Sciences Economiques in 1986.

As Director of the Technical Department at the AFESD, Dr El-Badawy was a strong supporter of ICARDA's mission to improve the welfare of the poor in the world's dry areas.

Commenting on the sad news, ICARDA Director General, Prof. Dr Adel El-Beltagy said, "The efforts of Dr El-Badawy to mobilize resources for the Center's activities helped promote the development process in WANA and strengthened regional priorities for agricultural research. The entire ICARDA community gratefully acknowledges the contributions she made to the Center's work in the region. She will be greatly missed."

On behalf of the Board of Trustees, management and staff of ICARDA, Prof. Dr El-Beltagy extends the ICARDA family's most sincere condolences to the family and colleagues of the late Dr El-Badawy. Dr Nasrat Fadda, former Director General of ICARDA, and Mrs Fadda join in sharing the grief and extending their condolences on the irreparable loss of Dr El-Badawi, who was a dear friend to them during their time at the Arab Fund, and later as a Trustee of the ICARDA Board. May the departed soul rest in peace.

And briefly...

Milk Production Improvement

ICARDA and the Fardous Organization, conducted a training course for women farmers on improved processing of milk products in March in Syria. Women farmers from Syria and Jordan learned about improved methods of milk collection and yogurt, cheese, and jameed processing, as well as improved feeding strategies.

IFAD Assistant-President Visits ICARDA

A delegation of senior officials, led by Mr James Carruthers, IFAD Assistant-President, visited ICARDA on 27 May to update themselves on the progress of the IFAD-funded ICARDA projects and discuss future plans.

ICARDA Scientist Receives Award

Dr Ashutosh Sarker, ICARDA Lentil Breeder, was awarded a certificate of recognition from the Government of Western Australia for his contribution to the development of 'Ceora'—the first low-toxin grass pea variety released in Australia.

EARO Thanks ICARDA

On the occasion of its 50th Golden Jubilee Anniversary in June, the Debre Zeit Agricultural Research Center of the Ethiopian Agricultural Research Organization (EARO), awarded ICARDA with a Certificate of Appreciation for the "invaluable cooperation, partnership, and support" that the Center has provided over the years.

Scientists Visit North Africa

ICARDA scientists visited Algeria, Morocco, and Tunisia in June to review the progress of the seed component of the Integrated Research and Durum Economics Network (IRDEN) project which aims to increase durum wheat production. Following field visits to project sites, pilot farmers for the establishment of seed production and marketing enterprises were identified.

Collaboration with the European Commission

The European Commission (EC) has been a member of the CGIAR since 1977, and is the Group's second largest multilateral investor after the World Bank. The Directorate General for Development and the EuropeAid Cooperation Office of the EC are responsible for liaison with the CGIAR.

The EC provides funding for the CGIAR through the "Food Security and Food Aid" program of the EuropeAid Cooperation Office. This global program was developed "to implement an innovative food security policy to bring assistance to developing countries facing food deficit problems—temporary and mostly structural—linked to poverty."

Since ICARDA's inception in 1977, the European Commission has committed approximately US$ 21 million for the Center's research programs. The research has helped resource-poor farmers by improving crop production in the Nile Valley and Red Sea and highland areas of the Mediterranean region through the use of disease-resistant, and drought- and cold-tolerant varieties of food and feed legumes, and cereals in more appropriate crop sequences.

More recently, the EC has provided substantial funding in support of ICARDA's germplasm conservation and enhancement research. Some examples of this work include the Mapping Adaptation of Barley to Drought Environments (MABDE) project which aims to understand the genetic and physiological processes that contributed to barley domestication and adaptation to drought, as well as intensive barley breeding conducted in the last century. The project, which began in 2003, will continue until 2005 and will use contemporary genetics and plant physiology tools to formulate a germplasm improvement strategy for water-use efficiency for barley under rainfed Mediterranean environments.

During the EC-funded workshop on participatory plant breeding, held at ICARDA, Dr B. Sakr, Plant Breeder, INRA, Morocco, explains the benefits of PPB to ICARDA Management and other workshop participants.

The EC also supports two projects on improving wheat productivity and water-use efficiency. The Improving Durum Wheat for Water-Use Efficiency and Yield Stability through Physiological and Molecular Markers (IDuWUE) project runs from 2003 to 2005 and aims to improve the water-use efficiency and nitrogen-use efficiency in durum wheat production systems in Mediterranean countries. Another project called Exploiting the Wheat Genome to Optimize Water Use in Mediterranean Ecosystems (TRITIMED) will identify crop traits and genetic ideotypes in wheat that impart higher and more stable yields under Mediterranean drought conditions. The project uses an integrated approach combining genomics, quantitative genetics and crop physiology to evaluate a range of different genotypes of durum and bread wheat for water-use efficiency, integrative morpho-physiological traits, and yield and quality under Mediterranean field conditions.

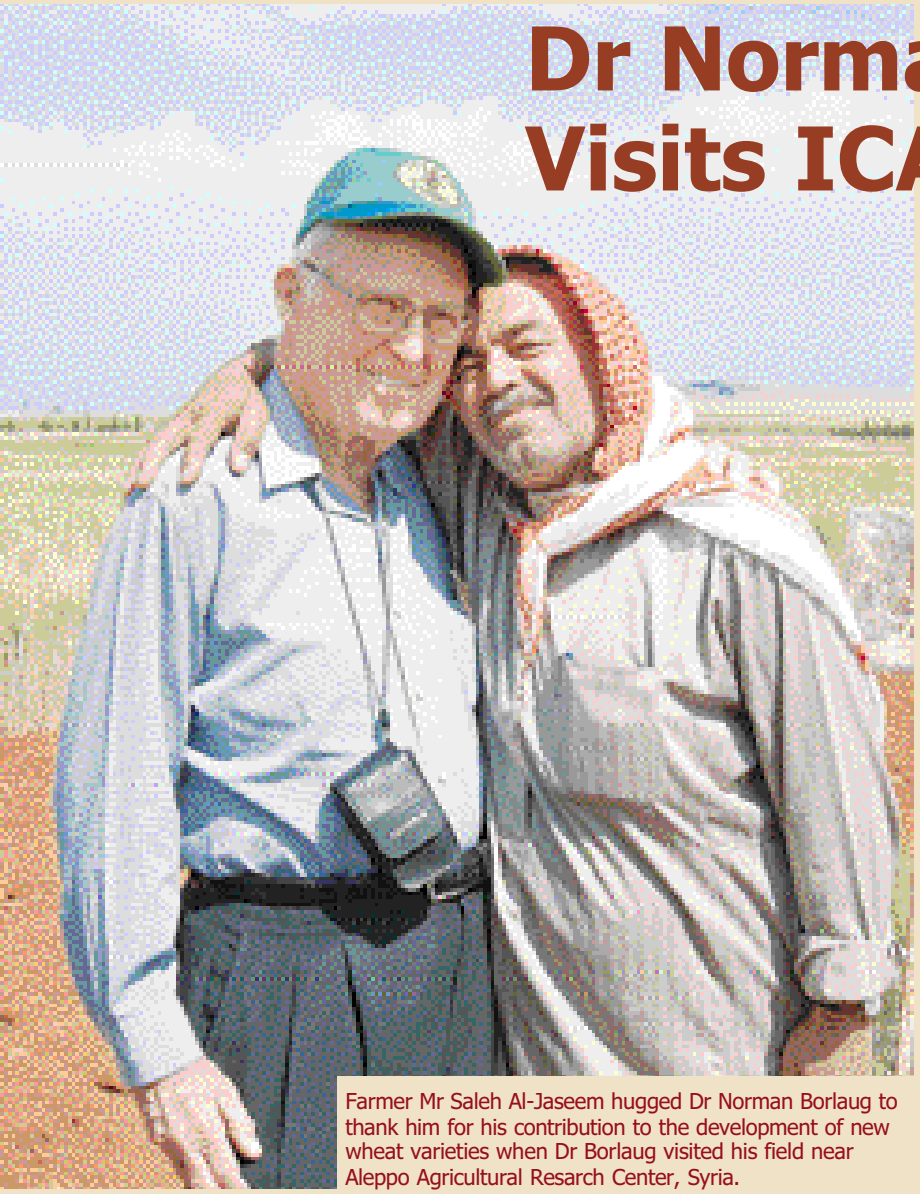
As part of the EC-funded research activities, scientists from Algeria, Egypt, Jordan, Morocco, Syria, and Tunisia attended a consultative workshop on Participatory Plant Breeding (PPB) held at ICARDA headquarters on 2-4 April 2005. The workshop was held within the framework of a project to create a network of scientists in Mediterranean countries committed to an innovative way of organizing plant breeding programs to produce diverse, better adapted germplasm, and aligned with the needs of rural communities; formulate plans and strategies on how to implement PPB in important crops; and widely disseminate methodologies and strategies.

The participants developed an action plan to introduce PPB in formal university courses, and recommended a series of follow-up workshops in each of the six countries involved in order to involve a larger number of scientists to facilitate the institutionalization of PPB and a regional project of PPB breeding which will cover different crops and different methodologies.

In addition to the EC, ICARDA receives support from member countries of the European Union.

Father of the Green Revolution

Dr Norman Borlaug Visits ICARDA



Farmer Mr Saleh Al-Jaseem hugged Dr Norman Borlaug to thank him for his contribution to the development of new wheat varieties when Dr Borlaug visited his field near Aleppo Agricultural Resarch Center, Syria.

ICARDA hosted Dr Norman E. Borlaug on 8-12 May 2005. His last visit to Tel Hadya, ICARDA's main research station, was in 1975 during negotiations with the Government of Syria on where to locate the Center. "This is a dream come true. We have been trying for years to have Dr Borlaug visit ICARDA," said Prof. Dr Adel El-Beltagy, ICARDA DG, as he received Dr Borlaug at the Center.

Dr Norman Borlaug, 91, has spent more than 60 years working on scientific agricultural research that has impacted the lives of millions of people worldwide. A wheat breeding program he started with his colleagues in the 1940s in Mexico led to the formation of the International Center for the Improvement of Maize and Wheat (CIMMYT) and later the International Rice Research Institute (IRRI) in the Philippines and eventually a total of 15 international centers supported by the Consultative Group on International Agricultural Research (CGIAR). Dr Borlaug played a leading role in the Green Revolution that saved millions from starvation, especially in South Asia. He received a Nobel Peace Prize in 1970.

During his visit to ICARDA, Dr Borlaug exchanged views with scientists involved in the CWANA Wheat Networks, visited ICARDA's wheat trials, met some farmers in and around Tel Hadya and presented a lecture entitled "From the Green to the Gene Revolution: A 21st Century Challenge." He recounted how his early work with the Cooperative Agricultural Program (1943-1960), supported by the Government of Mexico and Rockefeller Foundation on maize and wheat improvement used the combination of research, extension and training to increase production of those crops. "This was the first attempt to help a food-deficit nation," Dr Borlaug said, adding that "we measured our progress by what happened on farmers' fields, not on the number of scientific learned reports."

He attributed the success of the Green Revolution in Asia (especially China, India and Pakistan) to dynamic

political leadership in those countries that provided a supportive policy environment, and to improved crop varieties, control of weeds and pests, soil and water management. Demonstrations conducted on many farmers' fields showed multiple yield increases which enabled political leaders to support the Green Revolution activities. "The political leaders had to be convinced by seeing demonstrations on many thousands of farms, knowing the acceptability and productive capacity of the cereals," Dr Borlaug said. As a result of all the actions taken, cereal production in Asia increased from 309 million tons in 1961 to 962 million tons in 2000.

Turning to the contemporary challenges, Dr Borlaug said that the problem of hunger and malnutrition has not yet been solved, with an estimated 800 million people still going hungry. Noting the role of conflicts in enhancing hunger in the world, Dr Borlaug said "where there are no military conflicts we have not had massive or serious starvation." He challenged the current generation of researchers to work hard on improving crop varieties and agronomic technologies which will lead to increased food production. There will be a need to double the current food production to feed the global population in 2050.

On the Genetically Modified Organisms (GMOs), Dr Borlaug noted that biotechnology offers much promise to increase the dependability of yields, reduce production costs, and increase yields. He deplored the attacks against GMOs. "Farmers and scientists have been genetically modifying our crops. Mother Nature also has made 'GMOs' for millennia, adding whole sets of chromosomes consisting of thousands of genes. Take bread wheat, for example, which is a triple cross between three distinct grasses. Mother Nature made these crosses, adding whole sets of chromosomes (with thousands of genes) each time, to eventually create bread wheat, which can be used to produce a leavened loaf. And these were wide crosses. Most of them were sterile, but somehow, one or two were fertile, and from those came the modern wheat types. We need to bear this in mind in the biotechnology debate," he said.

He noted that there are many beneficial traits being developed through biotechnology. Herbicide resistance is revolutionizing soybean production in the USA and South America and is beginning to spread to other countries. This cuts cost of production, increases yield because of better weed control, and timely planting. Greater insect and disease resistance, tolerance to drought and cold temperatures, and improved nutritional quality are all in the research pipeline, he added.

He gave the example of the Bt cotton where biotechnologists have extracted a gene from a soil bacteria called Bt that confers excellent resistances to several classes of damaging insects. They have inserted Bt genes into cotton, as well as in maize and soybeans. "Some five million small-scale farmers in China, South Africa, and India are growing Bt cotton, greatly improving their yields and profitability, and significantly reducing their use of insecticides. The results in China are fantastic, with nearly 3 million hectares already planted." Dr Borlaug considers biotechnology as a new tool that is of great value, "and it can move genes across species and genera without sterility barriers."

After Dr Borlaug's lecture, Prof. Dr El-Beltagy presented him with a work of art created by an ICARDA staff member as a souvenir of his visit to the Center—a portrait of Dr Borlaug made with seeds of cereal and legume crops.

Dr Norman Borlaug; Dr Robert Havener, former Chair, Board of Trustees of ICARDA; and Prof. Dr Adel El-Beltagy, ICARDA DG, at an ancient olive oil press displayed outside ICARDA's Administration Building.

Norman E. Borlaug (1914) was born in the small Norwegian-American community of Saude, near Cresco in Iowa. After graduating from Cresco High School he studied at the University of Minnesota where he earned BS in forestry (1937), MS in forest pathology (1941) and PhD in plant pathology and genetics (1942). After three years of research work at E.I. du Pont de Nemours in Delaware, Dr Borlaug joined the Rockefeller Foundation cooperative project with the Mexican Ministry of Agriculture as head of the wheat research and improvement program. In 1966, his "Quiet Revolution in Wheat Improvement" created worldwide interest and the Rockefeller and Ford foundations, in cooperation with the Government of Mexico, established CIMMYT at El Batan near Mexico City. In 1970 he was awarded the Nobel Peace Prize for his "Green Revolution" which helped Pakistan, India and a number of other countries improve their food production. Dr Borlaug created the World Food prize in 1986 to honor those who have made significant and measurable contributions to improving the world's food supply. He continues to pursue fighting hunger through scientific research as the leader of the Sasakawa Africa Association, working from his laboratories at CIMMYT in Mexico.

Helping Small Enterprises Capture the Livestock Products Market in West Asia and North Africa

The good news is that demand for small ruminant products in West Asia and North Africa (WANA) is expected to grow due to increased affluence and population growth. The bad news is that the poor in marginal areas of the region whose livelihoods depend on livestock production may lose their market share due to low productivity and poor marketing infrastructure. Improper livestock production practices may also erode the natural resources.

Aden Aw-Hassan, Farouk Shomo, and Luis Iñiguez

Small ruminants (sheep and goats) are an important source of income for the poor living in semi-arid areas (less than 300 mm average annual rainfall) mainly because they require low initial capital and maintenance costs, and use marginal land and crop residues to produce milk and meat. They are a source of key nutrients, in particular proteins and minerals, for poor households. The WANA region is one of the important domestication centers from where small ruminants expanded to other areas. Current estimates indicate that there are 75 sheep and 35 goat breeds in the region, adapted to the marginal environments. The population of small ruminants in WANA increased from 380 million heads in 1960 to 660 million heads in 2000. Consumption of small ruminant meat, which increased from 1.2 to 3 million tons during 1961-2000, is expected to rise to 4.4 million tons by 2020.

Why the small ruminant sector is growing

A number of factors are leading to the growth of the small ruminant sector in WANA. Improvements in services such as free vaccination and availability of veterinary medicines are contributing to better health and reduced mortality

of flocks. Governments also intervene during drought periods to assist farmers through distribution of subsidized animal feeds, rescheduling of loans, and investments in water development and animal health. In the 1990s, several countries implemented measures and policies aimed at limiting the social and economic damage caused by droughts. These included emergency purchases and distribution of concentrate feed to livestock owners; veterinary measures, water development, and access to credit and debt relief.

Feed imports and use of crop residues as feed are contributing to the improvement in nutritional status of small ruminants in WANA. Though feed subsidies have been largely eliminated in recent years, producers, especially those with collateral, can still receive subsidized government loans to buy feed. Also, producers are now able to effectively collect and utilize crop residues, which have reduced such drought-mitigation practices as culling of animals. The reduced reliance on natural grazing and increased utilization of crop residues and purchased feed has also led to the development of intensive and semi-intensive production systems such as lamb fattening.

A significant factor in the trends of small ruminant production is income growth in the Gulf countries which has led to a rapid increase in meat consumption. In addition, the region has experienced rapid population growth and positive changes in average incomes. The population of WANA grew from 400 million in 1981 to more than 640 million in 2000. The increase in urbanization resulting from this high population and income growth has brought changes in dietary patterns in favor of meat consumption. This is because consumers in urban areas have more options to diversify their diets and are, therefore, likely to consume more meat and milk products.

The environmental costs

The increase in small ruminant production, however, is taking place at a heavy cost to the environment. High stocking rates have contributed to natural resource degradation, mainly vegetation and soil degradation and the loss of plant biodiversity. The resulting land degradation is increasing the pace of desertification as growing animal numbers compete for grazing resources. Desertification and soil degradation in WANA are affecting at least 709 million hectares of rangelands and are reaching alarming levels, particularly in Afghanistan, Algeria, Ethiopia, Iran, Morocco, Pakistan, Saudi Arabia, Sudan, and Turkey.

A sheep market in Syria.

How the poor are losing out

The increased demand for small ruminant meat in WANA offers both opportunities and challenges to small producers. In the past, most countries in the region imported small ruminant products from within WANA due to competitiveness, proximity, consumer preferences, established trade networks, and religious and cultural familiarity. However, many countries in WANA now import small ruminant meat from Australia, Bulgaria, Hungary, New Zealand and Romania. WANA countries currently hold about 61% of the market within the region, an indicator that local exporters are not taking full advantage of the expanding regional market and may even further lose market share if the trend continues.

Among the reasons for this decreasing share of the market are small ruminant health-related trade restrictions, poor market infrastructure, and lack of information about the dynamics of export markets and lack of polices to effectively respond to export market requirements. Gulf importers, for instance, say that livestock from

ICARDA's Research on Small Ruminant Production in the Dry Areas

ICARDA is conducting research aimed at improving the productivity of small ruminant production systems in Central and West Asia and North Africa to increase the incomes of farmers using a market-oriented and natural resource management approach.

Research areas

- Constraint analysis and characterization of production systems
- Characterization of markets and market opportunities for small ruminant products
- Processing of primary products
- Assessment of options to improve product quality
- Use of technologies to improve small ruminant productivity. Currently, attention is given to biological and economic feasibility of:
    - Enhancement of the feed base by identifying and utilizing promising forages
    - Strategies to improve small ruminant feeding systems (i.e. use of by-products and shrubs to cope with forage shortages)
    - Management strategies to better target market opportunities (i.e. breeding out of season for production systems with availability of feed resources, to produce milk and lambs in periods favored by higher demand and prices)

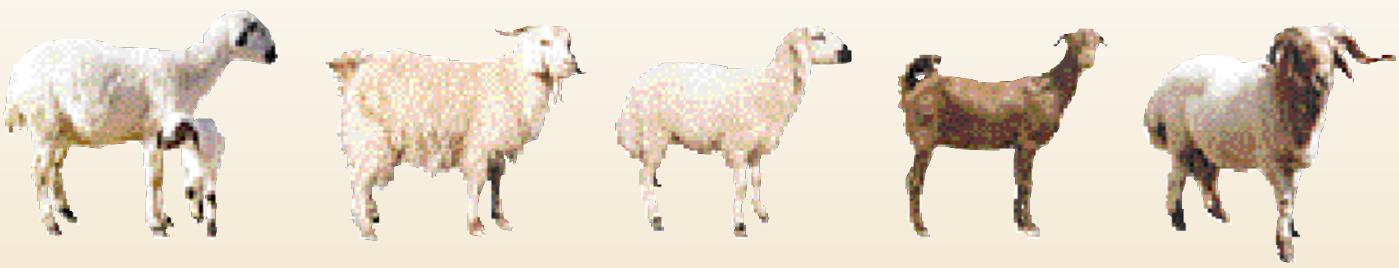
Complementary activities

ICARDA looks for strategic alliances with advanced research institutions through specific project development and the hosting of exchange researchers as well as post-graduate study programs. Areas of research include:

- Work on shrubs and by-product utilization to enhance the feed base
- Mineral deficiencies in dry areas
- Identification of main causes and improvement of low fertility rates in sheep and goats
- Adaptation of traits to improve productivity
- Quality of products
- Modeling of small ruminant production incorporating range and crop-livestock interactions
- Small ruminant epidemiology and biological control to reduce parasite loads
- Inbreeding levels in non-registered and non-recorded flocks/herds

Facilities

ICARDA has modern research facilities which include laboratories for animal nutrition and health analysis, a milk processing plant to transform milk into derivatives, and a flock of about 400 Awassi sheep and a herd of 70 Shami (or Damascus) goats for specific on-station studies.



Australia and New Zealand arrive in much better physical shape than those from the horn of African countries because of better handling. In addition, many small ruminant producers in WANA use nomadic, semi-nomadic or transhumance production systems which rely on the use of common rangelands for feed resources and living space. Because rangelands are state-owned, producers have no incentives to invest and improve their livestock productivity. Therefore, extensive production systems with low productivity dominate. These systems are relatively less competitive.

Farmers discuss the benefits of an elevated milking ramp with an ICARDA researcher.

In order for the poor small ruminant producers to compete favorably on the increasingly open market, a number of changes need to be made in policies, production systems and marketing. ICARDA has been studying various options (see page 16) with the national agricultural research systems in the region.

Technology options

The adoption of improved animal health and nutrition practices, genetic enhancement and better handling are essential for achieving higher small ruminant productivity. Plant species adapted to the dry areas can increase feed supply, particularly during dry years, as the experience of North African countries like Tunisia and Morocco, which now grow cactus, shows. Spineless cactus or shrub (Atriplex halimus) alone or intercropped with barley, vetch, oats, or other forage crops can improve the supply and quality of feed resources and prevent soil erosion, especially on hillsides. Multi-nutrient feed blocks, made from agro-industrial by-products and other ingredients, are a low-cost source of feed and nutrient supplementation that can increase animal productivity. Early weaning of lambs is another way to increase milk production and economic returns. Improved rams can be distributed to producers to improve flock performance. Lamb fattening, dairy processing into high-value commodities and targeting of niche markets with specific products can help increase earnings from small ruminant enterprises.

Policy options

At the national level, policy action is needed on measures that stimulate the adoption of productivity-enhancing practices and measures that increase investment in the vast rangelands on which many livestock producers rely. Policies that encourage organized communities to collectively manage their grazing areas could have a positive impact. Policy actions are also needed from exporting countries to assure importing countries that livestock production meets the required standards with minimum risks to human health. At the regional level, common polices and coordinated efforts on animal health-related regulations and common livestock trade rules are essential to improve trade and producers' income. Many of the small ruminant producers who live in the marginal dry areas have no or little landholdings, which makes them ineligible for credit from formal sources. Informal credit from traders is often the only source of capital with very high interest rates. New institutional reforms, such as community-based microcredit that improve the access to capital, should be investigated.

Conclusions

Increasing population, urbanization and incomes in WANA are leading to a growth in demand for animal products, which opens opportunities for poor farmers in domestic and export markets. However, these farmers face the challenge of producing for a competitive market. There is a need to focus on improving production and marketing infrastructure to enable small livestock producers retain a reasonable share of the market.

Dr Aden Aw-Hassan (a.aw-hassan@cgiar.org) is an Agricultural Economist; Mr Farouk Shomo is a Research Associate (Economics); and Dr Luis Iñiguez is a Senior Small-Ruminant Scientist at ICARDA.

Livestock Production in Central Asia: Constraints and Opportunities

Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan) has a population of about 32.6 million small ruminants, and a rangeland area covering 250 million hectares. Livestock production is still an important source of livelihood for poor producers. However, the breakdown of the Soviet Union brought a shift to a new economic system, which changed the production context dramatically with severe impacts on the livestock production sector. ICARDA has been working with national partners and international institutions to help small producers benefit from the new production systems.

Luis Iñiguez, M. Suleimenov, S. Yusupov, A. Ajibekov, M. Kineev, S. Kheremov, A. Abdusattarov, D. Thomas, and M. Musaeva

The Soviet era was characterized by two types of agricultural enterprise: cooperative farms (koljoz) and state farms (sovjoz). With the collapse of the Soviet Union, the large farm enterprises were broken into cooperatives, individual, and household farms. The cooperative farms are various kinds of joint stock companies with the involvement of government, particularly in Turkmenistan and Uzbekistan. Individual farms are registered as legal entities, with the owner usually acting as the farm manager having a group of hired labor for farm operations. Individual farms vary in size, normally fitting into a medium-size operation, but could be as small as a household or as large as a collective farm.

Large-scale farms still play an important role in livestock production in countries with gradual reforms, while they almost were substituted by household farms in countries with more liberalized economies.

The application of reforms was also accompanied by the deterioration, and, in some cases, dissolution, of production organization and support services, and the lack of funding for modernized research and technology transfer. Though farmers are largely educated and some have working experience and knowledge in animal and agricultural production, their knowledge is mainly in large-scale production rather than low-input small-scale production technologies and strategies. In addition, credit or any form of financial support for production is not widely available. In general, a culture of borrowing money was not developed during Soviet times, and companies never financed the purchase of farm assets. Thus, farmers are supposed to pay the total cost of machinery or agricultural inputs in cash. This results in limited availability of machinery, equipment and farm inputs. There have been efforts by the different countries to develop some forms of credit, but these programs have not been effective because they ask for unaffordable collateral and interest rates.

The emerging production systems do not adequately utilize rangelands—the cheapest feed source. Large flocks/herds of small ruminants were formerly managed by different seasonal and rotational grazing strategies, some involving the movement of flocks through several thousand kilometers a year to graze seasonal ranges. But the movement of flocks by small producers is now virtually impossible, as this requires capital and special arrangements that smallholders cannot afford. As a consequence, animals over-graze nearby ranges and under-graze remote ranges.

Studies conducted by ICARDA identified a problem of high feeding costs and scarcity of fodder during winter because farmers do not stock adequate fodder. This is due to the lack of machinery and infrastructure. Machinery is mostly obsolete, whereas available infrastructure, mostly built to suit large farm operations, is not suited to the needs of smallholders. Large barns and silos constructed during Soviet times were systematically dismantled. With less feed resources, farmers have to purchase feed, particularly during winter, which accounts for 50 to 63% of farm costs.

In addition, there are other problems including the emergence of new animal health problems in the region. Due to the lack of reliable epidemiological systems and assessments, the magnitude of this problem is hard to estimate.

Mulberry trees are a valuable feed source in regions of Central Asia such as Samarkand, Uzbekistan.

Animal health services are provided by the government, but are inadequate to satisfy demand. Furthermore, with the collapse of breeding programs there are serious risks to the integrity of genetic resources because of indiscriminate crossing among breeds, disappearance of breeds or wrong targeting of breeding goals.

Herders in Kemin, Kyrgyzstan, depend on highland range grazing.

The collapse of the large Soviet market also means limited opportunities for farmers to market their products. A recent assessment found that the quality of wool was poor with little chance to successfully compete with global producers. The market for Karakul pelts is also saturated. The poor market infrastructure and strategies also limit producers in capturing markets. Even where the market offers good opportunities, the returns per flock on traditional products such as wool, skins or pelts, offer little incentive to small producers. Left with few options to generate income, farmers began to sell their animal stocks. This translated into a dramatic animal population decline. For instance, by 1998, the population of small ruminants in Kazakhstan had decreased to 10 million from 35 millions heads in 1990 (nearly 70%).

Possible role of research

Central Asia needs strong agricultural research systems to help solve these problems and improve the incomes of farmers. Several organizations have embarked on research activities in livestock production in the region. The United States Department of Agriculture (USDA) provided the first international support to ICARDA for research undertaken in 1996. The Universities of California-Davis and Wisconsin-Madison, funded by the Global Livestock Collaborative Research Support Program (CRSP), also joined in these efforts.

A research project on "Feed and Livestock Production in the Steppes of Central Asia," funded by IFAD and implemented by ICARDA, identified the following research topics that need urgent attention:

- Emphasis on a new research approach oriented to the emerging production and farm environment
- Types of production systems, constraints and interactions among them in relation to use of natural resources, livestock management, and marketing
- Winter feeding and enhancement of the feed base
- Production orientation and diversification to target market opportunities
- Assessment of biodiversity and access by farmers to improved germplasm
- Institutional strengthening

Studies conducted by ICARDA

The mobile flock

In 2000, a study was conducted in Berlik community in Kazakhstan. The village area is heavily overgrazed with evident erosion while remote ranges are unused. The village is mostly composed of smallholders with few heads of livestock including small ruminants. Discussions were held with 24 farmers on the possibility of putting together a consolidated, mobile flock for collective grazing for a period of 7 months in distant ranges, at least 15 km from the villages. Issues discussed included the rangeland to be grazed, the availability of wells and the potential areas of conflict with other farmers with the right of access to the remote ranges. The grazing fee was calculated to be 450 Tenge per animal, which represents 12 to 15% of the price of an animal.

In 2001, the mobile herd was tried. A total of 23 farmers entrusted their sheep and goats (from 1 to 70 animals per family) to one shepherd. On 20 April, when the herd moved to a remote range, it had a total number of 593 heads (305 adult sheep and goats, and 288 lambs and kids). Most of the sheep were Kazakh fine-wool animals. The animals were finally moved to the mountains for summer grazing. On 29 June, the average live-weight of lambs was 31.8 kg (23 to 35.5 kg). The shepherd predicted that no weight gains would be expected in July and the beginning of August due to the intense summer heat, but further gains in live-weight would occur from the end of August to the end of October. By this period, the

lambs weighed 40 to 45 kg, regardless of date of birth and, more importantly, they were all sold.

Using mulberry trees for improving feeding systems

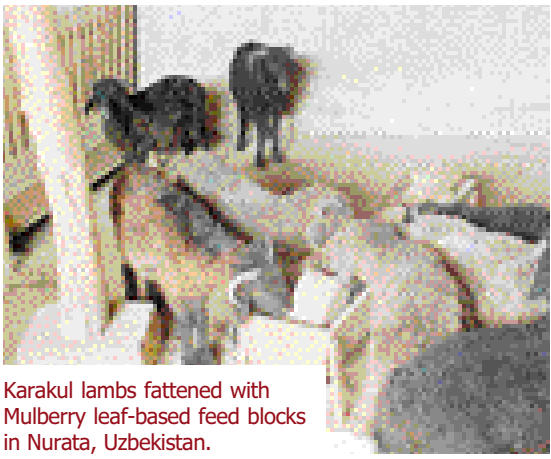
In the ongoing research with scientists at the Karakul Research Institute of Uzbekistan, Samarkand, the use of mulberry leaves in livestock feeding systems was considered. The assessment of the availability of this feeding material indicated that there are about 800 specialized silk farms in the country, including about 33,000 hectares of mulberry (8 million trees), in addition to 93 million trees along the roads or dividing cropping areas, giving a total of about of 100 million trees. It is estimated that there are nearly 1.6 million trees in the Samarkand region alone. With a high value of metabolizable energy, mulberry leaves provide a natural concentrate for feed.

Early lambing

Results of early lambing in the conditions of foothill semi-deserts are confirming the potential of this technology to improve Karakul and Sarajin sheep production in Uzbekistan and Turkmenistan. This technology allows ewes to benefit from spring pastures to restore body weight faster, increase the crop of lambs, produce healthy lambs, produce good quality pelts (in the case of Karakul sheep), and accelerate weaning. The studies conducted in collaboration with scientists at the Karakul Research Institute of Uzbekistan showed that the drop in weight from mating to lambing was more accentuated in late than early mating/lambing. The drop in body weight in ewes mated/lambed in August/January, September/February and October/March was 6.6, 9.2 and 9.7 kg, respectively. The weight recovery in ewes that lambed early (in January and February) was faster than those lambing in the traditional period, thus it is expected that fertility rates of early lambed ewes will be improved. In all cases, the earliest lambing animals reached the heavier post-lambing weights by June. In the Uzbekistan trial, by April-May the lambs born early in January had already reached the weights that lambs from the traditional period would attain at the time of their weaning in July. This finding opens the possibility of weaning lambs by May and placing them in a fattening program to target market opportunities, or if good summer pastures are available, grazing them for natural fattening in the range (Nagul system).

Lamb fattening

Different fattening strategies were tested in Uzbekistan, Kazakhstan and Turkmenistan, adding to the menu of alternatives for generating income. Lessons were learned on maximizing profits of farmers at minimum cost. In some areas, like in Kyrgyzstan and Kazakhstan with good rangelands and feed grain, the Nagul system seems to be the base for building any fattening strategy. However, the Nagul system was not as appropriate for the desert steppes of Turkmenistan and Uzbekistan. The Nagul system consists of fattening or pre-fattening lambs in the rangelands, after weaning, and has proved its efficiency in the case of good range fodder availability in summer ranges. An additional achievement was the introduction of feed block technology, associated with fattening and strategic feeding trials. This new technology, which has captured the interest of farmers in Nurata, Uzbekistan, could help to integrate available agro-industrial by-products for intensive production diets such as for fattening.



Karakul lambs fattened with Mulberry leaf-based feed blocks in Nurata, Uzbekistan.

Assessment of diversity of breeds

ICARDA has undertaken a major research in the cataloging of small ruminants in Central Asia. Information on on-station breed characterization, obtained during the Soviet Union, has been condensed and documented by each country, and a book containing this characterization information is being prepared. In addition, the monitoring of on-farm production of only major indigenous breeds was started in each country in order to realize the actual production performance of the breeds outside a controlled environment and to learn more about the suitability of indigenous vs. improved breeds under current conditions. ICARDA is looking into possible col-

laboration with advanced research organizations to undertake the genetic characterization of the breeds to identify possible relationships among breeds and further steps in the conservation and management of these resources.

Strengthening research institutions

Scientific organizations in Central Asia are poorly equipped and their staff underpaid. Though improvements are occurring in some countries, this situation is likely to continue in the near future. There is an urgent need to train scientists, particularly in problem-solving and community-based research, upgrade research infrastructure, and a desirable level of communication within the region.

Conclusion

The economic transition in Central Asia has significantly affected the livestock sector. The changes were not followed by adequate institutional arrangements in the farming and research environments. Thus, farmers did not find adequate access to new market opportunities, and research failed to address farmers' production problems. Though limited, market opportunities exist in the countries and could provide options for reorientation or diversification of the production systems. However, investments should be made in carefully learning the socioeconomic implications and institutional arrangements needed for effective changes to take place. The different application of reforms in the countries leading to different sets of farm environments and conditions offer a unique opportunity to look upon in order to identify complementarities among farming systems for better exploitation of the natural resource base and market targeting.

Dr Luis Iñiguez (l.iniguez@cgiar.org) is a Senior Small-Ruminant Scientist at ICARDA; Dr M. Suleimenov is a scientist with ICARDA-CAC & PFU/CGIAR in Tashkent, Uzbekistan; Dr S. Yusupov is a scientist with the Karakul Sheep Breeding and Desert Ecology Research Institute, Samarkand, Uzbekistan; Dr A. Ajibekov is a scientist at the Agrarian Science and Consulting Services Center, Bishkek, Kyrgyzstan; Dr M. Kineev is a scientist at the Research Production Center of Livestock and Veterinary, Almaty, Kazakhstan; Dr S. Kheremov is a scientist at the Turkmen Agricultural University, Ashgabat, Turkmenistan; Dr A. Abdusattarov is a scientist at the Uzbek Scientific Production Center of Agriculture (USPCA), Tashkent, Uzbekistan; Dr D. Thomas is a reseacher at the University of Wisconsin-Madison, USA; and Ms Madina Musaeva is a Research Fellow, ICARDA, Tashkent, Uzbekistan.

Small Ruminant Breeds in West Asia and North Africa

The West Asia and North Africa (WANA) region is a known center of diversity for a number of domestic animal species. There is strong evidence that, more than 10,000 years ago, the domestication of small ruminants took place in West Asia, and these species subsequently dispersed to other regions. But how many breeds of goats and sheep are there in WANA today? How have these survived in the dry environments of the region? ICARDA and its partners have conducted studies to characterize the breeds.

By Luis Iñiguez

The WANA region is endowed with a rich genetic diversity of small ruminants. This consists of various breeds of sheep and goats which are adapted to a range of arid and semi-arid environmental conditions. Other than camels, sheep and goats are the only domestic species whose produce currently makes an important economic contribution under the marginal conditions of the dry areas of WANA and, as a result, offers farmers opportunities to enhance their diet and generate income. This region is subject to water scarcity and fluctuations in rainfall, which often lead to severe, recurring droughts. Under these marginal conditions, sheep and goats are the most important domestic species and are an integral component of the area's agricultural production systems. Because of this, small ruminant production has been part of ICARDA's research agenda for more than 20 years.

In 1998, ICARDA began an initiative to comprehensively document characteristics of the different small ruminant breeds in WANA and to identify ways in which they serve farmers according to their specializations and adaptations. The next step was to identify ways to manage them more rationally. With the support of the Inter-Center Working Group for Genetic Resources (ICWG-GR), coordinated by the International Plant Genetic Resources Institute (IPGRI), ICARDA, in partnership with the International Livestock Research Institute (ILRI), organized a workshop, attended by country representatives of WANA, to discuss a plan for the characterization of the small ruminant breeds. The plan involved three tasks: to produce an inventory of the breeds in the region; to develop a methodological framework to improve farmers' access to improved germplasm by introducing decentralized breeding schemes owned and managed by farmers; and to assess the genetic relationships among breeds using molecular genetic techniques.

In 2000, also with the support of the ICWG-GR, ICARDA commissioned country studies in North Africa (Algeria, Egypt, Morocco and Tunisia) and the major small ruminant producing countries of West Asia (Cyprus, Iran, Iraq, Jordan, Lebanon, Syria, and Turkey). The studies gave comprehensive descriptions of both the importance of small ruminants in each country and their population sizes and distribution, while simultaneously assessing any threats to genetic diversity. The phenotypic characteristics and, where possible, the genetic characteristics of the breeds were also described.

Diversity of the small ruminant breeds in the region

Sheep

A total of 75 non-repeated sheep breeds were found in the 11 countries reviewed across WANA. There are 28

breeds in North Africa (37% of the total number of breeds) and 47 breeds (63%) in West Asia. Excluded from this tally were breeds with repeated names which had only recently been imported into the region. Also excluded were breeds common to several countries (i.e. Arabi in Iran and Iraq, Karakul in Iran and Turkey, and Awassi in Jordan, Lebanon, Syria, Turkey, and Iraq) and breeds which are assumed to be the same but which have different names in neighboring countries (i.e. Chios in Cyprus and Sakiz in Turkey, Ouled Djellel in Algeria and Queue Fine de l'Ouest in Tunisia). The countries found to have the largest level of diversity include Iran, Turkey, and Egypt, which contained 24, 12, and 12 breeds, respectively. In the first two cases, the large level of diversity combines with the largest small ruminant populations in the region. Egypt, which has a smaller population of small ruminants than Algeria and Morocco, has the third largest diversity of sheep breeds. By contrast, ranking fifth in the population tally, Syria only has one breed of sheep: the Awassi.

The Karakul sheep has its large dispersion in Central Asia, in particular in Uzbekistan and to a lesser extent in Turkmenistan and Kazakhstan. The Karakul is also found in Iran and Turkey. It should also be noted that the Tuj sheep from Turkey is probably the same breed as the Tushetian breed from the Caucasus.

With the exception of the Awassi breed in Syria (which is scattered all over the country), in general, the breeds of small ruminants follow well-defined distributions in particular ecological niches, reflecting local adaptations that would be very valuable in improvement efforts if they could be identified and understood. Examples of animals adapted to constrained environments are the Barki sheep and the D'man sheep, which are found in very dry areas of North Africa. Furthermore, most mountain goats are the only animals able to utilize range resources in rugged landscapes. In general the breeds are suited to the conditions found in the dry areas, where long periods of drought cause fluctuations in feed availability.

Most of the breeds are fat-tailed (53 of 75), with a remarkable variability in types of tail. The fat tail is an adaptation that allows sheep to cope better with fluctuations in feed availability; they utilize feed stored as fat deposits in periods of scarcity, and replenish their fat tails in periods of plentiful feed. It is predicted that global warming will cause some dry areas to become even drier. Under such conditions, adaptations such as those available in the breeds of WANA may be extremely valuable.

The distribution of fat-tailed sheep extends from West Asia through Central Asia as far as China and Mongolia. Thin-tailed breeds are more numerous in North Africa. In Algeria and Tunisia only the Barbarine sheep is fat-tailed, while in Morocco all breeds are thin-tailed. The inter-relationships of these breeds constitute an interesting research topic related to the dispersal of breeds after domestication. ICARDA is addressing some aspects of this through its studies on characterization of breeds found in WANA, the Caucasus, and Central Asia. Coincidentally, fat-tailed sheep are well-distributed along the Silk Road, which linked China and Europe and may have resulted in important germplasm exchanges in the past.

Goats

Goat breeds in WANA are less well characterized than sheep breeds. With the exception of the Shami or Damascus goat and some other major breeds, little is known about the goat breeds in the region. Apart from Cyprus, goat producers

Sheep with fat tails are suited to environments with extreme fluctuations in fodder availability during the year.

The Jabali goat breed is very common in the highland areas of Syria.

have also been neglected by development efforts; they are thus considered one of the most vulnerable and resource-poor segments of the livestock production sector.

Considerable genetic diversity is also evident in the goats of the region. With the exception of Shami, if the native breeds of neighboring countries are assumed to be different, even though they may have similar names (i.e. the Baladi goat), there are 32 non-repeated goat breeds across WANA, out of a total of 35 breeds reported. The Shami breed has the broadest distribution in West Asia and is influencing, through cross-breeding programs, the goat populations of Egypt and several countries in North Africa. The four countries exhibiting the largest level of goat diversity are Egypt, Iran, Algeria, and Turkey (seven, five, four, and four breeds, respectively).

ICARDA expects to publish a book by September 2005, with detailed information on the small ruminant breeds in WANA, compiled during the characterization of the breeds in the 11 countries. Most of the information included was collected at research stations or at universities, obtained as a by-product of economic or general production surveys. For the first time it was also possible to collect all information available to assess the risks posed to genetic diversity and the status of breeding programs in each country. It is expected that this information will serve as a valuable foundation for new efforts focusing on the management and conservation of these valuable resources.

Dr Luis Iñiguez (l.iniguez@cgiar.org) is a Senior Small-Ruminant Scientist at ICARDA.

The Jabali Goat in Syria

Syria has a goat population of approximately one million distributed all over the country and more concentrated in the west and south. The goat breeds found in the country are the Shami, Baladi and Jabali. The Jabali is the most common breed in mountainous areas from where its name is derived.

The Jabali goat contributes significantly to the livelihoods of resource-poor farmers through the supply of milk and meat. Farmers raise Jabali goats because of their good adaptation to the harsh and rugged conditions of mountainous environments and their ability to utilize fodder sources that usually would not be reached by other species.

Main products

Main products obtained from Jabali goats are meat, milk and milk derivates. Milk derivatives include butter, yogurt, labneh (dry yogurt), shinglish, ghee (fat) and jameed (kitha).

Breed characteristics

The Jabali goat is of medium size with short to medium long ears and a straight nose. The predominant color is black. In a study conducted on 217 Jabali goats, the proportion of black, white and mixed goats was 90%, 4%, and 6%, respectively. All animals observed were horned. Most had curved horns of different lengths. The bucks usually had large spiral shaped horns facing sideways. Males tend to reach the maximum heights at 4 years, while females later at 5 years.

Production constraints

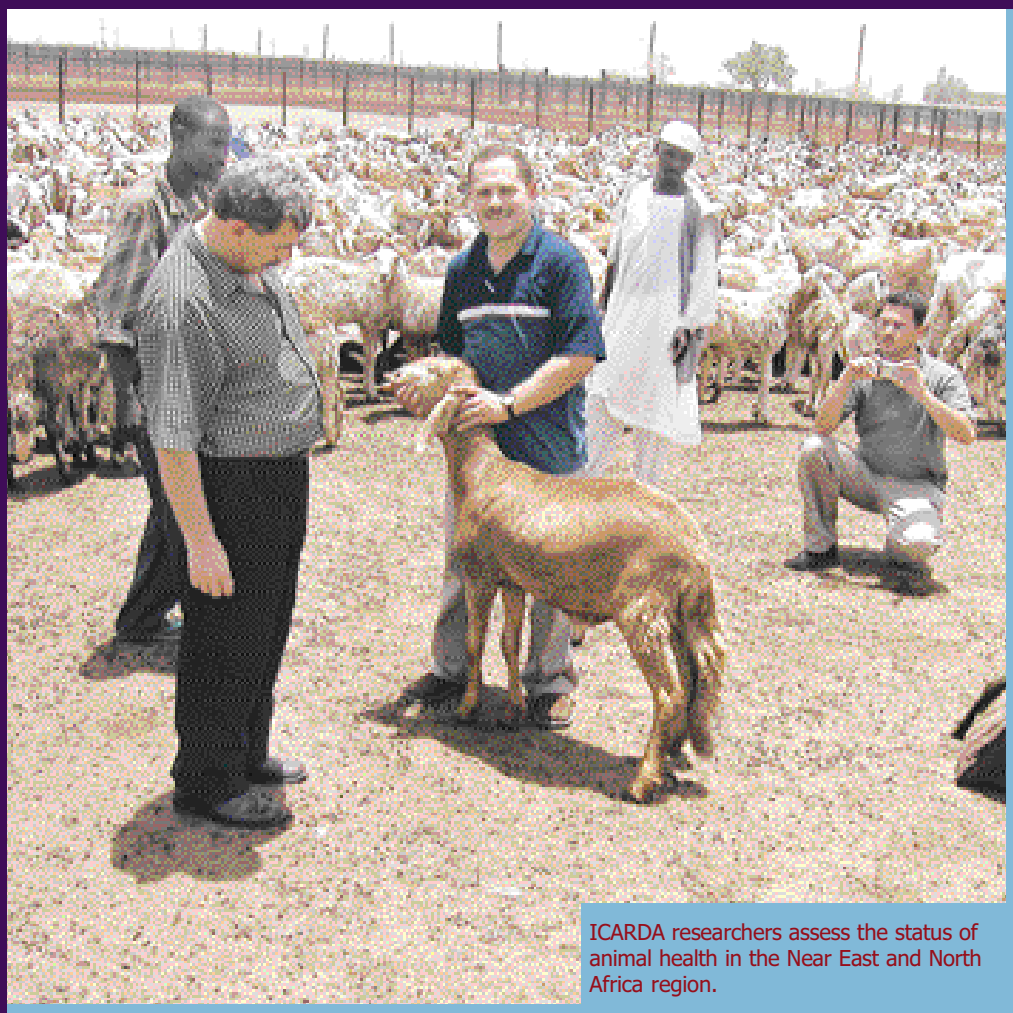
Feed shortages due to limited grazing land, particularly in winter when the range could be covered with snow; the associated feeding costs to cope with feed shortages; difficulties in marketing milk products because of lack of transportation and low prices offered by the middlemen; and health problems especially those affecting newly-born kids.

This study was conducted in collaboration with BOKU University, Austria.

Improving Small Ruminant Health

By Aggrey Majok, M. Jabbar, and A. Aw-Hassan

Animal health remains one of the major constraints to livestock production systems in the Near East and North Africa (NENA) region. A new ILRI/ICARDA project, funded by IFAD and conducted in partnership with the national agricultural research systems of Jordan, Sudan, Syria and Tunisia is determining the current limitations posed by poor health services in order to determine what can be done to safeguard farmers' herds.



ICARDA researchers assess the status of animal health in the Near East and North Africa region.

Better animal health means increased wealth for livestock owners in the NENA region. But all too often this simple equation becomes complicated as poor farmers with small herds deal with diseases that adversely affect their livestock and, consequently, their livelihoods and development prospects. A lack of effective disease control, poor access to veterinary services, high cost of drugs, and a lack of skills in mounting effective disease surveillance further complicate matters for these farmers. Small-scale farmers are also unable to effectively compete against the more market-oriented medium- to large-scale livestock entrepreneurs, who are able to successfully capitalize on the growing demand for meat and animal products.

In January 2004, ICARDA and ILRI (International Livestock Research Institute) started a project that will first assess the current animal health situation in countries in the NENA region and then identify potential solutions to the major problems. The project, called "Small Ruminant Health—Improved Livelihoods and Market Opportunities for Poor Famers in the Near East and North Africa (NENA) Region," specifically aims to contribute to improving livelihoods of poor farmers in the NENA region by increasing productivity and enhancing access to local, national and regional livestock markets through research targeted at improving small ruminant health.

A livestock market and slaughterhouse in Sudan.

This project is designed to provide action-oriented research results at two levels. At the local level, the emphasis is to better understand the delivery and adoption of animal health and other livestock services to poor farmers, and constraints to local market access by the poor. The overall objective at the national and regional levels is to increase market efficiency and access through research into marketing constraints (policies, reducing transaction costs such as transportation and taxes), and decreasing the threat of market exclusion/disruptions due to the occurrence of small ruminant diseases.

In an attempt to achieve these overall objectives, the project researchers first needed to select study sites in Jordan, Sudan, Syria and Tunisia to determine the status of animal health in each country. At a meeting held at ICARDA headquarters in June 2004, the scientists devised a common methodological approach, with a focus on the market chain. They also chose sample sites in Jordan, Sudan, Syria and Tunisia that had a wide variety of production systems (nomadic, semi-sedentary, mixed crop/livestock), market outlets (domestic, export, or a mixture of both), and a significant poverty rate.

The project then began conducting a series of surveys designed to collect information on farm-level constraints to health that affect market access, and its implications; health constraints in the market chain from farm to local consumers; and the organizational structure and regulatory environment of the health delivery system. The capacity building component of the project has already trained 18 staff members (14 in Sudan and 2 each in Jordan and Syria) in Livestock Marketing Assessment; and 10 each in Jordan, Syria, Sudan, and Tunisia have been trained in survey techniques and the principles of disease surveillance. So far, four students are registered with ICARDA for MSC studies.

The project has been focusing on completing all the surveys and gathering all the necessary data before beginning to devise strategies that will support regional, national and local capacity for disease diagnosis, conduct epidemiologic and socioeconomic analysis to assess risk, and develop disease control strategies at sub-national, national, and regional levels.

Dr Aggrey Majok(a.majok@cgiar.org) is an Epidemiologist and ILRI/ICARDA Project Coordinator based at ICARDA; Dr M. Jabbar is an Agricultural Economist at ILRI; and Dr Aden Aw-Hassan is an Agricultural Economist at ICARDA.

Expanding the Menu: Transforming By-products into Nutritious Feed

An innovative project uses non-conventional agro-industrial by-products to improve the nutrition and productivity of livestock in the drylands.

Safouh Rihawi

The picture of the drylands, particularly in the Central and West Asia and North Africa (CWANA) region, doesn't seem complete without a herd of sheep grazing on dry brush. But this common image belies the very basic challenge of raising a healthy, productive herd in an often overgrazed, degraded, water-scarce environment. While the productivity of the vast rangelands in the region is diminishing, the growing rate of urban migration and population growth is fueling an ever-increasing demand for animal products, particularly meat and milk derivatives.

But the supply of livestock products is not satisfying the demand. Small-ruminant meat production in the West Asia and North Africa (WANA) region increased from 1.4 million metric tons in 1970 to 2.9 in 2000; meat consumption, on the other hand, increased from 1.5 million metric tons to 3.0 in the same period, resulting in a deficit of 100,000 metric tons that is partially covered by imported meat. By developing low-cost alternative sources of feed and improving livestock nutrition, farmers in the region have the opportunity to raise their income by capitalizing on this demand without overgrazing the rangelands.

The concept of using supplemental feed made from agricultural by-products is not new. Farmers routinely take advantage of the benefits of incorporating left-overs such as cottonseed cake, sugar beet pulp, and wheat bran into animal diets. However, farmers are often unaware of the many other options available to them. So ICARDA researchers recently studied the potential of incorporating other ingredients in animal feed such as tomato pulp, molasses, burghul derivatives, crude olive cake, sesame cake, citrus pulp, sunflower cake, and mulberry leaves with promising results.

Tomato pulp

Every year Syria produces around 610,000 tons of tomatoes. After processing, however, 42,000 tons of highly nutritious pulp remains unused. Most of the pulp is produced in July and August—two months of the small-ruminant mating season when the only feed available on dry pastures is straw and stubble. The challenge with using tomato pulp is its high moisture content of 18-20%. The extra moisture means that the nutrients remain soluble and special care must be taken during processing to prevent their loss. There is also a higher chance of fermentation and mold.

ICARDA researchers tested three efficient, low-cost methods to preserve and use tomato pulp--sun drying, ensiling, and adding it to other feed blocks. Sun drying the pulp or mixing it with straw or crude olive cake proved to be effective in preserving the pulp and produced a highly nutritious feed with 21% crude protein and 9 MJ metabolizable energy. Ensiling, a method of preservation through acid fermentation in an airtight chamber, is traditionally done with barley or corn crops. Attempts to preserve tomato pulp using this method also proved successful and showed a slight increase in live-weight gain of sheep for a lower cost. Including tomato pulp in urea-based feed blocks produced a low-cost feed with high levels of crude protein and metabolisable energy equivalent to known concentrate feeds. All three options proved to be worthwhile giving farmers the option to choose methods that are appropriate to their budgets and facilities.

Feed blocks made from tomato by-products.

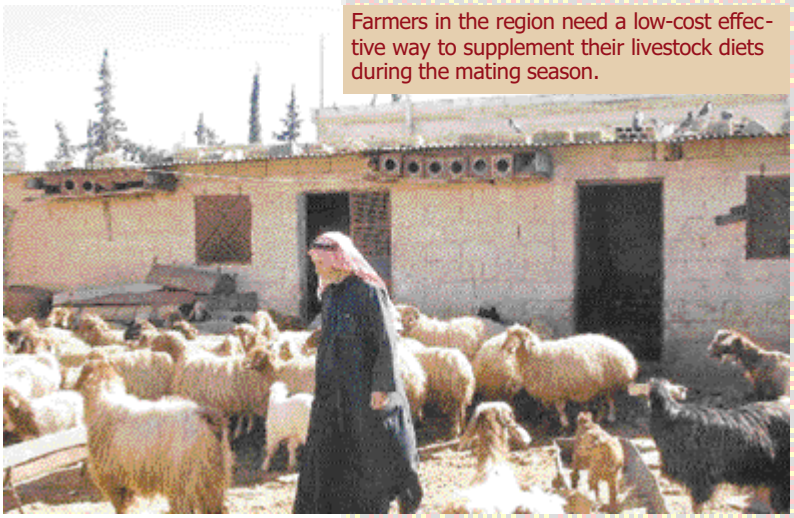
The idea of feed blocks has already proved to be very successful in Jordan. ICARDA worked in close collaboration with the National Center for Agricultural Research and Technology Transfer (NCARTT) to introduce and promote the use of feed block technology in Jordan. The project imported seven feed block production units from Iraq. They were given to women's associations and the private sector to produce feed blocks on a commercial scale. Farmers and extension agents were introduced to the technology at farmer field days and also through the television, radio, and press.

When ICARDA and NCARTT scientists heard of a tomato paste factory in the Jordan Valley that was having problems getting rid of its waste without polluting the environment, they were quick to see the potential in the situation. Scientists designed a machine to dry and grind the tomato by-product into a palatable feed. Researchers then contacted the nearby Der Alla Rural Women's Cooperative Society's feed block unit so that they could start incorporating the tomato-based by-product into their feed blocks.

Jordanian farmers were pleased with the feed block technology. They found that their sheep did not drop or eat their wool, habits that are triggered by malnutrition. They also realized that sheep and goat health improved due to a reduction in internal parasites. On-farm data showed that sheep and goats grew 20% faster when fed with feed blocks and sheep fertility increased by 20%.

Urea-Based Feed Blocks

Urea is an important source of nitrogen for small ruminants. However, it can be poisonous if ingested in large quantities. So ICARDA researchers tried to find ways to ensure that only appropriate amounts of urea reached the animals through their diets. One way to do this was to create feed blocks using urea and the cereal stubble left in the fields after harvest. Trials were conducted with farmers in northern Syria and researchers compared the use of traditional supplements, including barley, cottonseed meal and wheat



Farmers in the region need a low-cost effective way to supplement their livestock diets during the mating season.

bran, to the new feed blocks. They found that sheep fed with the feed blocks had a higher live-weight gain than those fed with traditional supplements. Using the feed blocks was also cheaper. The feed blocks only cost 0.9 SL/head/day (US$ 1 = 51.5 SL), whereas the barley, wheat bran, and cottonseed meal cost farmers around 2.5 SL/head/day. The implications of this research is important for both farmers that normally use expensive concentrates and those that do not supplement cereal stubble with a source of urea.

Mulberry leaves

Mulberry trees with red and white fruits are relatively common in northern Syria. ICARDA researchers found that these trees can provide a good source of quality feed for small ruminants. Mulberry leaves have a crude protein content of 18% and a dry-matter digestibility of 62%, similar to those of vetch hay, an excellent fodder also produced locally. This research was first initiated in Uzbekistan (see page 21).

Future steps

The next step calls for spreading the message and forging networks for the transportation of by-products to the fields to improve the quantity and quality of milk and meat from small-ruminant systems. Now that ICARDA researchers have identified the availability and benefits of using these industrial by-products, farmers will need to be educated about the new options available to them. There is also great potential for the establishment of agri-businesses for manufacturing feed blocks, using these by-products for the benefit of the farmers in the region.

Dr Safouh Rihawi (s.rihawi@cgiar.org) is a Livestock Nutritionist at ICARDA.

The Challenge of Rangeland Degradation in WANA: Going Beyond Restoration

James Tiedeman

Quick-fix approaches to save the fast depleting rangelands have included development of technologies to restore degraded lands. While this may work for a short time, eventually the rangelands get degraded again. ICARDA is conducting experiments that tackle the root-causes of the problem through community approaches.

Sheep grazing on degraded rangeland in North Africa.

The increasing population of small ruminants has led to significant changes in the production systems in West Asia and North Africa (WANA). Traditionally, native vegetation in the rangelands provided a large proportion of the feed for the small ruminant population. However, because there are now about five times the number of animals utilizing the same area, rangelands that provided 70% of the total feed resources in the 1950's, provide only 10-25% at the present. Not only are the rangeland resources insufficient to meet current demand, the absolute level of feed resources is declining due to erosion and land degradation caused by overgrazing, excessive fuel harvesting, and plowing.

Inappropriate policies on land use and the absence of secure property rights have exacerbated the problem. In most countries in the region, the traditional local institutions governing access to grazing lands have been disrupted, resulting in a system of "open access," but with no corresponding regulatory mechanisms to control the extent and intensity of grazing. In addition to unfavorable environmental impacts, there are indications that the decline in the productivity of the rangelands is contributing to poverty and outmigration.

Research on the rangeland has largely focused on restoration of degraded lands through the introduction of a wide range of technologies. ICARDA has worked with its partners in WANA on a number of technology options including: (i) use of appropriate amounts and types of phosphate fertilizers, reseeding with native pasture legumes, and deferred grazing during flowering and seed set; (ii) development of low-cost technologies for rangeland reseeding, like the pitting machine; (iii) the use of feed blocks as a strategic supplement; and (iv) the cactus technology and Atriplex alley-cropping (see page 34).

Cactus plantation in Tunisia.

Fertilizer application

Application of phosphorus fertilizer to native rangeland and weedy fallow has been a successful tool to increase the legume composition. Nitrogen on the other hand increases the grasses, especially annuals, but at a detriment to nitrogen-fixing legumes. A 25% increase in legume biomass was achieved in Morocco and Syria with phosphorus application.

Planting cactus

Cactus was introduced in North Africa over 100 years ago and is a well accepted technology. It provides fruits, pads as fodder, and serves as a fence around fields and homesteads. Cactus pears in Tunisia are the most expensive fruit on the market and are even exported. Spineless varieties have been successfully introduced in frost-free areas where humidity is not too low for long extended periods. The pads are chopped and fed to sheep and cattle during the dry season (90% of the pads is water) and as emergency fodder. Extensive areas have been planted to cactus with assistance from government agencies and programs.

Acacia cyanophylla

This is a forage shrub legume grown in Tunisia as an emergency feed and for fuelwood. If fed in small quantities after drying it can sustain livestock through the drought seasons.

Direct reseeding with a pitting machine

The pitting machine is a simple modified disk plow equipped with a large seed box driven by the disk. The rolling disk of the machine scoops a string of discontinued pits spaced about 100 cm apart in the soil, allowing water, soil, organic matter and even native seeds to accumulate in the pits. Seeds are synchronically dropped from the seed box into the pits while the machine is moving. It was tested on 200 hectares of degraded rangeland in northeastern Syria and found to successfully reseed native Artemisia and Salsola species.

Using the pitting machine for planting seeds of native vegetation.

Rangeland restoration alone is not the answer

Most rangeland can be improved or sustained with proper grazing management but severely degraded ranges may need to be restored by planting suitable species. It is well known that restoration of the rangeland alone is not the answer. In many cases excessive cutting, grazing and browsing has destroyed plantations after they have been established. In order to sustain and improve rangeland productivity, proper management using a participatory community approach is needed. Government institutions must participate as partners in the process to empower the herders, and provide assurance to the community that their efforts and investments will be rewarded. Policy reform is often needed. The community approach should include education on grazing management, analysis of existing relevant biological and socio-economic community data and development of a community grazing management plan to be implemented and monitored in a participatory manner.

This community approach was successfully used by ICARDA in the Oudja community in Morocco where a scientific ecological assessment was combined with farmer interviews. Farmers provided their knowledge of the changes in vegetation and conditions as detected and quantified by the scientific studies, remote sensing, image analysis and ecological data sampling at the various sites. The blend of indigenous knowledge and scientific research has made it possible to assess and characterize the socio-ecological resources used in priority setting and the development of community management plans. The model used in this project has now been scaled out to rangeland management activities implemented by ICARDA and national programs in Algeria, Libya, Mauritania, and Tunisia within the framework of a project financed by the Swiss Agency for Development Cooperation (SDC).

Conclusion

Most research efforts on sustainable rangelands have focused on restoration rather than management. However, it is crucial to consider rangeland management because poor management is the root-cause of the degradation. There are only two basic approaches to grazing management of communal range: controlled stocking rate and rotational grazing. Rotation should be designed with community participation that provides rest during part of the growing season to allow increased root growth and biomass. Research is needed to determine social mechanisms for pastoralists to implement rotational grazing. New policies may be needed to enable community management because inappropriate policies have often reduced the ability of pastoralists to manage rangeland. Participatory community approaches are recommended.

Dr James Tiedeman (j.tiedeman@cgiar.org) is a Range Management Scientist at ICARDA.

Documenting the Impact:

How Effective is Atriplex Alley Cropping

ICARDA's Mashreq and Maghreb project developed many new technologies that successfully address the problems in the development of sustainable and integrated crop/livestock production in the low rainfall areas affected by land degradation and poverty. Now that both phases of the project are complete, ICARDA's socioeconomists have conducted some of the first comprehensive studies to assess the impact of these technologies on the lives of farmers in the dry areas. They ask the difficult question: Have we made a difference? Here is the answer.

K. Shideed, A. Laamari, M. Boughlala, H. Benouda, H. Mahyou, R. Mrabet, M. El Mourid, A. Aw-Hassan, Hammudi, M. Rahmi, H. El Mzouri, and R. Thomas

Barley-livestock farming system (barley/fallow or continuous barley) is typical in the dry areas of the West Asia and North Africa (WANA) region. This has resulted in the degradation of natural resources and decreased productivity, which, in turn, has contributed to food and feed insecurity. The overall result is an increase in poverty and reduced livelihood options for rural communities.

ICARDA and national researchers in Algeria, Iraq, Jordan, Lebanon, Libya, Morocco, Syria, and Tunisia have developed technologies that improve crop/livestock systems to enhance and stabilize production and quality of feed, and reduce pressure on the natural resources (both arable and rangelands). To this end, a regional project on "the Development of Integrated Crop/Livestock Production Systems in the Low Rainfall Areas of the Mashreq and Maghreb Region (M&M

Project)" was initiated in 1995 and implemented in two phases, 1995-1998, and 1998-2002. The project has been supported by the International Fund for Agricultural Development (IFAD), the Arab Fund for Economic and Social Development (AFESD), the International Development Research Centre (IDRC), the Ford Foundation, the CGIAR System-wide Program on Property Rights and Collective Action (CAPRi), and the Forum Euro-Mediterraneen des Instituts Economiques (FEMISE).

This article focuses on one of the M&M technologies—alley cropping, or the practice of growing perennial crops (in this case Atriplex), simultaneously with an arable crop (barley). Atriplex, also known as saltbush, thrives in dry alkaline soils and has a high protein content. Alley cropping of Atriplex with barley is a technology that has been introduced in Morocco. While the potential benefits of the introduced technology, such as an increase in barley production, reduced soil erosion, improved soil organic matter, reduced feeding costs, a source of emergency feed during drought seasons, and reduced grazing pressure are well known, the extent of the impact of these technologies had not yet been documented. ICARDA's socioeconomists decided to take a closer look at the site of Irzaine—a 58,00 hectare area that receives an average of 260 mm of rainfall per year in the community of Tancherfi, in the Oujda Province in Morocco.

Adoption of the New Technology

Researchers first attempted to determine the rate of adoption of alley cropping in the study area and also what factors were important in the adoption process. They conducted a farm survey of some 100 farmers and found that the technology had spread to nearly 1650 hectares (24%) in Irzaine in the four year period (1999/00 - 2002/03). The area planted to Atriplex has increased annually by 6% and researchers estimated the rate of adoption of the technology to be 33%. Most of the farmers said they heard of this new technology through the extension service in Morocco and from neighboring farmers.

The researchers found that the rate of adoption depended on three factors: the size of the farm, the size of the flock, and the subsidy that the development project offered to those who adopted the technology.

Farm size and adoption

Researchers found that farmers with small farms (<20 hectares) are relatively less willing to sacrifice their arable land to planting Atriplex. The adoption rate among these farmers was 59%. However, 90% of the farmers with medium-size farms (between 20 and 40 hectares) and 100% of the farmers with large farms (>40%) adopted the new technology, which means that Atriplex alley cropping will be adopted at lower adoption rates in areas that are predominantly characterized by small-size farms.

Flock size and adoption

The larger the flock the more willing the farmers were to adopt the new technology. Researchers found that farmers who do not own any small ruminants did not adopt the technology, whereas close to 50% of those with small flocks (<40 heads) adopted the technology. Almost all the large-flock farmers (with an average of 104 heads) adopted the technology.

Subsidy and adoption

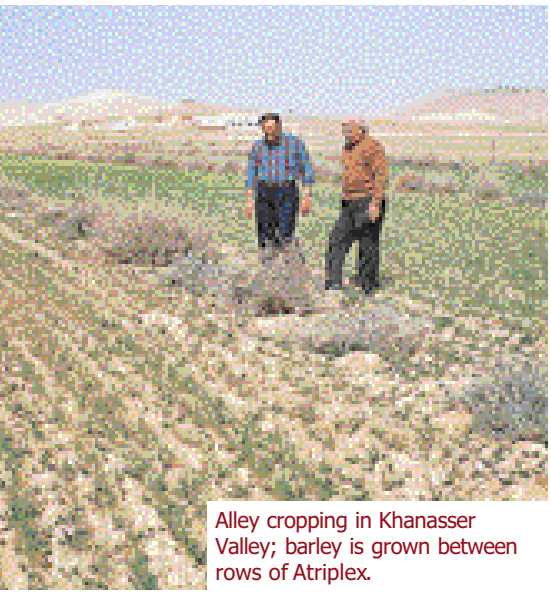
When researchers looked at the number of farmers who adopted the technology, they realized that most of the farmers had accepted the subsidy provided by the development project which encouraged the adoption of Atriplex alley cropping. The researchers found that the net impact of the subsidy was to increase the area devoted to Atriplex by 79%. This means that the technology adoption rate would fall from 33% to 3% had the price subsidy not been offered to the farmers. This realization has important policy implications for those governments that are trying to spread this technology in their countries. It is worth noting that such subsidies are not cash payments to farmers, they are the costs of implementing the technology (land preparation, transplants, irrigation, maintenance) and include the expenses of staff involved in technology dissemination. These are incentives which have encouraged farmers to invest in productive resources, and thus are more effective in improving rural livelihoods on sustainable basis compared to direct feed subsidies. Such investment decisions are very important for the development of these marginal environ-

ments, given the fact that public and private investments are negligible in dry areas of the region, which are the hot spots of poverty in CWANA.

The Impact of Atriplex Alley Cropping

Impact on barley grain and straw yield

A comparison of farm survey data showed that fields that were planted with Atriplex resulted in a 31% higher barley grain yield and a 97% higher barley straw yield when compared to a barley/fallow system. However, researchers realized that these numbers could be a result of a combination of several factors and not just of planting Atriplex. So, they attempted to isolate the effects of Atriplex on grain and straw yield in order to ascertain the net impact of the technology.



Alley cropping in Khanasser Valley; barley is grown between rows of Atriplex.

They found that given the same level of inputs, the grain yield advantage of planting Atriplex over the barley/fallow system was 17%. Similarly, they found that there is potential to increase the straw yield almost two-fold with Atriplex alley cropping instead of the traditional barley/fallow system. For livestock holders, the increase in straw yields is particularly important because they usually allow their flocks to graze on the barley stubble after harvest; with Atriplex alley cropping their flocks will have more to eat with the same amount of inputs.

Impact on flock size

If farmers feel secure that they will be able to feed their animals, they will not hesitate to increase their flock size. Atriplex is a good risk mitigation strategy for those farmers who are thinking of increasing their flock size, because during a drought season the sheep can graze on Atriplex shrubs. An increase in flock size is usually a sign of an increase in the wealth of the farmer.

Researchers found that between 2001 and 2004 all farmers increased their flock size. However, they attempted to isolate the effects of the technology and remove the variables that could have also caused an increase in the flock size such as three years of favorable weather conditions and better flock management. The researchers developed a regression model and found that 25% of the increase in the number of small ruminants among those who adopted the technology could be attributed to the use of alley cropping. This represents a significant increase in the physical capital, which is the main source of wealth for farmers in the region.

Impact on feed resources and feeding cost

Farmers usually supplement their animals' diets with purchased feed—wheat bran or sugar beet pulp—at a high cost. However, those who have adopted Atriplex alley cropping were able to reduce their dependence on these purchased resources. Researchers found that those who adopted the technology reduced the consumption of sugar beet by 23%, and wheat bran by 90%. On average, this translates to a 33% reduction in feeding costs due to Atriplex, though the results vary with the flock size. The feeding costs were reduced by 30% for those with small flocks, and by 70% for those with large flocks.

Internal Rate of Return

The Internal Rate of Return (IRR) of a technology is the break-even interest rates which equates the benefits and costs streams of investments in Atriplex plantation. Researchers calculated that the IRR will be around 29% for Atriplex alley cropping, which is much higher than the commercial interest rate of 10%. It seems that this technology has the potential to significantly affect poor farmers in the West Asia and North Africa region. Farmers are able to reduce feeding costs, improve their yields, and own more animals without increasing their costs. Now, the focus is on scaling-out this technology to other countries using this study as a guide to target those farmers who would most benefit from planting rows of Atriplex shrubs in their fields of barley.

Drs K. Shideed (k.shideed@cgiar.org), M. El-Mourid, A. Aw-Hassan, and R. Thomas are senior scientists at ICARDA. Drs A. Laamari, M. Boughlala, H. Benouda, H. Mahyou, R. Mrabet, Hammudi, M. Rahmi, and H. El Mzouri are senior scientists at the Institut National de la Recherche Agronomique (INRA), Morocco.

More Yogurt, Please!

Muhi El-Dine Hilali, Luis Iñiguez, and Monika Zaklouta

Sour, weak and crumbling yogurt is not attractive to many consumers. When producers take this type of product to the market, they fail to fetch a profit. A recent study by ICARDA scientists identified simple ways for small-scale producers to improve the processing of milk into yogurt and increase their income.

An ICARDA scientist demonstrates the use of commercial starters for improved yogurt production.

Yogurt, it is believed, originated in the Near East, where nomads first produced it. Consumption is highest in Mediterranean countries, West and Central Asia and the Caucasus. In Syria, production of yogurt has been rising steadily, reflecting increased demand. Whereas about 59,000 tons of yogurt was produced in the country in 1999, production rose to more than 90,000 tons in 2003.

Consumers have different tastes. Some prefer yogurt in the form of a highly viscous liquid, while others want it as a softer gel. Typical yogurt-based products in the Middle East include the set type (Laban, Khather), drinking type (Ayran)—mainly consumed in summer-and the concentrated type (Labneh).

The rise in demand brings potential benefits to producers, especially small farmers who depend on processing dairy products to diversify their incomes. However, the increased production has meant that producers must continue to improve the quality of the product to satisfy the expectations of their customers. Small farmers are already facing the challenge of increasing competition in the market, because their yogurt is often of poor quality due to improper processing practices.

ICARDA researchers have been working with extensionists and communities in Abu-Jabar and Bugaz villages in northern Syria, where farmers depend on sheep milk processing for 60% of their incomes, to improve the quality of their products and enable them to benefit from the widening but competitive market. Participatory workshops were held to assess the peculiarities of local knowledge and the constraints to production as perceived by the farmers. The workshops were held both for men and women, as inclusion of women was critical considering that they are the ones who process milk into derivatives.

How yogurt is made

Yogurt is prepared by lactic acid fermentation. Milk is inoculated with a starter culture which converts part of the lactose to lactic acid, carbon dioxide, acetic acid, diacetyl, acetaldehyde and several other substances that confer the product's particular characteristics. The consistency, flavor and aroma vary with the source of milk from different species and locations, probably reflecting the type of diets that animals consume.

Traditional milking procedures often cause high levels of contamination due to poor hygiene. After milking, the milk is filtered and processed, and if the quantity is small it is stored in a cool place—in areas without cooling facilities. The milk obtained the night before is mixed with that obtained in the morning to process it for making yogurt. It is boiled in a pot for at least five minutes and then transferred into three-liter buckets to form a small foam layer on the top of the filled bucket (surface). Then the milk is left to cool. The temperature is checked by thumb. As soon as the milk has the "proper" temperature, it is inoculated by yogurt (starter) obtained the day before, at the dose of approximately 100 g per bucket diluted in an amount of the prepared milk. The inoculation is done from the side of the bucket in order to preserve the surface.

The buckets are incubated by covering with blankets for about four hours, depending on weather conditions. After this, the buckets are uncovered and cooled, and the yogurt is ready for the market. This process produces set-type yogurt with a thick surface mainly with or without burned flavor.

Improving production

Farmers reported that they could not get good prices for their yogurt on the market because it was sour, with a weak texture, and crumbling especially in transit through bumpy roads. Researchers discussed with farmers the possible causes of these constraints. It was agreed that improper hygiene was a major cause of the problem. Training sessions were held in both communities during which the research team worked with farmers to explain basic hygienic milk management, improved yogurt processing and culture management. Thermometers were introduced to eliminate product contamination with thumbs and help determine temperatures for starter inoculation.

To avoid the collapse of yogurt during transportation, a participatory experiment was conducted to compare three industrial starters that produce firm yogurt with the starter used traditionally by farmers. The three included the very mild flavor and high viscosity, mild flavor and medium viscosity, and strong flavor and medium-to-low viscosity. Yogurt was processed with the three starters and that of the farmers as a control, with the use of thermometers. The different types of yogurt were evaluated by the farmers and sent to the market for additional evaluation.

Farmers' children preferred yogurt with very mild and mild flavor, whereas their parents preferred their own yogurt and that with strong flavor. The processed yogurt types were evaluated for viscosity and firmness. The increase in viscosity was 60 to 72% higher than the control. The firmness of the yogurt was measured with a texture analyzer, using a 20 mm cylinder probe to penetrate the yogurt for 25 mm. The results showed that yogurt made with the industrial starters was 20-30% firmer than local yogurt and thus could be transported without collapsing. The new yogurt made 5 additional Syrian Pounds per kilogram than the yogurt traditionally prepared by the farmers. This is the cost of transporting a bucket of 3 kg of yogurt from the farm to the market. This motivated farmers to accept the new starters that allow them to produce a better quality product for sale.

With a better product for the competitive market, farmers in Abu-Jabar and Bugaz villages in northern Syria now hope that the demand for their yogurt will increase in the market.

Mr Muhi El-Dine Hilali (m.hilali@cgiar.org) is a Milk Technologist; Dr Luis Iñiguez is a Senior Small-Ruminant Scientist; and Ms Monika Zaklouta is Animal Research Laboratory Manager at ICARDA.

The Potential of Partnership with the Jabbans of Syria

The migratory lifestyle of the Jabbans, or cheese makers, in Syria is slowly changing, especially in terms of working places. They are moving from the Khanasser Valley towards the steppe where more dairy sheep are raised. ICARDA took a closer look at this group to better understand how this small-scale informal industry works, the services it provides to local communities, and what technological improvements could be introduced through partnership with the Jabbans.

Malika Abdelali-Martini, Aden Aw-Hassan, and Hisham Salahieh

Jamal Yussef Steif and his family.

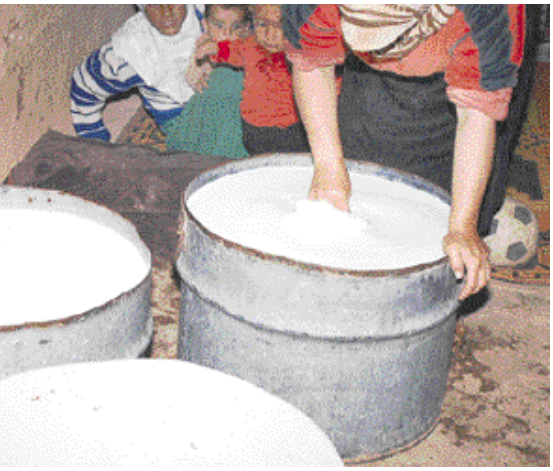
For most of the year, Jamal Yussef Steif (Abu Khaled) works on his farm in Tel A'adeh village in Idlib province, Syria, with his wife, Um Khaled, and their three children. But every spring, during the milking season, the family members leave their farm and travel to Adameh village in the Khanasser Valley, a dry marginal area located in northwest Syria, where sheep production is a dominant source of income, to become Jabbans or cheese makers. Many other Jabbans come from the same area to Khanasser.

Making Cheese in the Dry Areas

Livestock producers in Khanasser Valley take their flocks to the nearby hills early in the morning to graze. The women milk the animals at around 11:00 am and walk over to the Jabbans house or tent usually on the outskirts of the village, to deliver fresh milk.

The delivery of the milk marks the beginning of a busy day for the cheese maker's family. The Jabbans usually process the milk collected from the village. But, during the last few years, with the improvements in communication means and roads, some of them have started collecting milk from neighboring villages too. In that case, the man usually leaves for the neighboring villages in his pick-up truck, and collects the milk in large blue containers that fill the back of his truck.

When milk is delivered, the Jabban women (usually wife and daughters, or in other cases joined by other women relatives) start the cheese making process. To make the cheese, Um Khaled pours the milk into large containers, filtering it through a piece of tightly-



stretched thin cloth to ensure its cleanliness. Each container holds around 80/90 liters of milk. Once the container is full, Um Khaled adds a spoonful of rennet and stirs the milk.

Then she covers the containers and leaves them for an hour or so; by then the milk congeals into large chunks of cheese. After the hour is over, Um Khaled stirs the container once again and then transfers small quantities of the chunks into a round dish that she places in a large sink. The water oozing from the wet cheese drains into a small hose that runs out into a metal container at the back of the house. This drained water is later used to make cheese (called Arisheh) that is of lower quality and is bought by the poor.

Um Khaled ties the cheese into a tight round packet. Once she has four or five of these packets, she piles them on top of each other into a press. She tightens the press every few hours to keep the water squeezing out. Um Khaled goes through this process many times a day with the milk that the villagers bring her and that which her husband has collected from the villages nearby. She converts around 400-800 litres of milk into cheese each day.

In about three hours, the cheese is ready. By 5 a.m. the next morning, it is sold to middle-men or traders through the Jabbans who take it to the market. The cheese made by the Jabbans and by local communities cannot be eaten directly. It is first boiled (since the milk is not pasteurized before the cheese is made) and sometimes additional flavorings are added. This value-adding is done by men workers at the middle-men level and then the cheese that is preserved in containers filled with salt and water is ready to be sold.

A Serious Decline

Since the 1970s, milk in the Khanasser Valley has been processed into cheese by Jabbans' institutions. These institutions provide fundamental services to farmers such as access to the markets in cities, input supply, and credit and safety nets against unexpected shortfalls due to drought or crop and livestock losses. Hence they play a critical role in the livelihoods of the rural poor. But the number of Jabbans has seriously declined. In the 1970s, 77% of the villages in the Khanasser Valley had at least a Jabban each. In 2003, only 23% had a Jabban each. ICARDA scientists conducted a survey to understand the reasons for this decline.

More than 55% of the farmers surveyed cited the decline in numbers of dairy sheep in the Valley and, the consequent decline in milk production, as well as the replacement of fallow land with cumin cultivations, which resulted in less land available for grazing, as the most important reasons for the decline in the number of Jabbans. Many dairy sheep producers have shifted towards lamb fattening through investors and traders from Aleppo city. Other reasons reported were that farmers are making more yogurt rather than cheese because of its better price in the markets, and the improved means of communication; and sometimes there is a lack of consensus on the prices of milk.

Women in the Khanasser Valley usually milk the sheep.

Despite the decline in the numbers of Jabbans, cheese processing remains an important area and a source of additional income for the poor compared to sheep fattening. Cheese making is an inherently sustainable activity because the money provides additional income directly to the livestock owners, whereas fattening costs are provided by investors in the city, and depends on live sheep export regulations.

How the Jabbans Serve the Local Communities

The Jabbans are an example of a local institution with embedded social capital. The social capital of a society is the institutions, relationships, attitudes, and values between various players that contribute to a mutual economic and social development. The local institutions of dairy production provide through Jabbans fundamental services to dairy sheep producers, such as marketing, input supply, loans and safety nets against unexpected shortfalls due to drought or crop and livestock losses. The Jabbans also handle small quantities of milk delivered by the poorest, which cannot be marketed otherwise, especially in the absence of a formal infrastructure and easy access to markets.

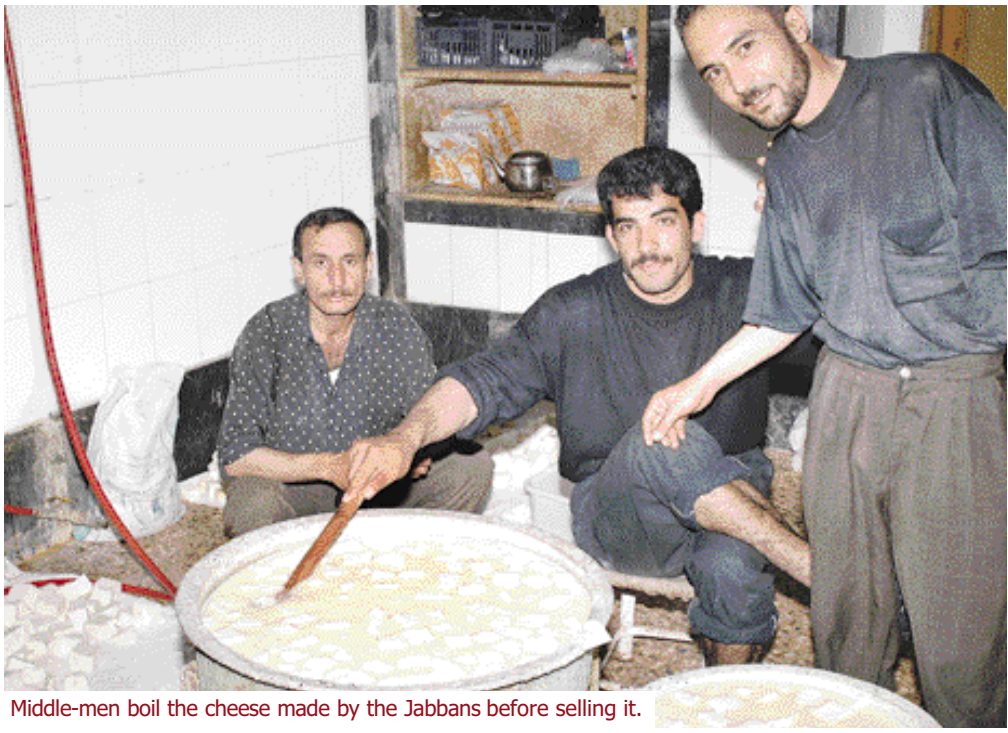
However, the benefits of participating in local institutional arrangements may be uneven and the poor may be disadvantaged because of their weak negotiating position and vulnerability that limits their options. Results from a study of 44 villages in the Khanasser Valley, revealed the local institutional arrangements in relation to sheep milk production and processing and the embedded social capital. Using qualitative and quantitative methods, the research analyzed the terms of arrangements between traders and dairy sheep producers in milk collection, delivery, processing and marketing to determine whether there was equity of benefits between all the players involved. The factors that determine the payment for milk delivered to traders/processors, the distributional effects of these arrangements and the factors influencing the poor's access to these institutions were also analyzed. They revealed an interesting parallelism of known relations between farmers and milk processing plants. This analysis aims at developing adequate recommendations to improve dairy production using the Jabbans' institutions as a vehicle for change.

The use of the sustainable livelihood approach which focuses on people and looks for sustainability of achievements, provided a holistic perspective, and was imple-

mented through partners; the most important feature of the approach is that it builds on strengths of the people, particularly the poor.

The Gender Dimension in Dairy Production

During the survey, the research identified a clear gender division of activities in dairy production, processing and marketing. The farmers/milk producers are represented by both men and women, though it is mostly the women who provide most of their time to livestock care, and milk production and processing. However, among the Jabbans, it is mainly the women and children who are involved in milk production and cheese processing, whereas the men handle the marketing and usually control the income as well. The middlemen/traders are only men. This gender division becomes important when newly-developed technologies are transferred to the farmers. Technologies related to milk processing should then reach both types of milk producers. Hygiene and basic health issues should start at the farm and at the Jabbans levels at the same time.



Middle-men boil the cheese made by the Jabbans before selling it.

Conclusion and Future Work

Though imperfect, local institutions provide essential services to the poor particularly in the absence of adequate infrastructure and markets. Milk producers have multiple benefits from cheese makers/traders such as access to market and loans. They are very well organized and trusted by the communities, and attuned to traditional environment. These institutions could serve as a substitute to formal institutions and safety nets, but need to be strengthened to take additional roles and responsibilities that serve the poor.

The research raises questions on whether it would be possible to introduce improved dairy technology to the milk producers through Jabbans and what role current arrangements play, how any new technology will change the total value of the dairy products and the distribution of the benefits, and whether the Jabbans could be used as a means for reaching the poor in the delivery of credit. Another challenge is to assess whether these arrangements could be considered as safety nets for the communities, and what interventions could help stabilize or sustain the production system.

Dr Malika Abdelali-Martini (m.martini@cgiar.org) is a Socioeconomic and Gender Analysis Specialist; Dr Aden Aw-Hassan is an Agricultural Economist; and Dr Hisham Salahieh is a Research Associate at ICARDA.

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New publications

Healing Wounds: How the International Agricultural Research Centers of the CGIAR Help Rebuild Agriculture in Countries Affected by Conflict and Natural Disasters. 2005. Varma, Surendra and Winslow, Mark. Consultative Group on International Agricultural Research (CGIAR), Washington, DC. 96 pp. ISBN: 92-9127-153-9

This publication is a product of a Marketing Group project of the CGIAR, hosted by ICARDA. The involvement of CGIAR Centers in rebuilding agriculture in countries affected by conflict and natural disasters spans nearly three decades and has benefited more than 47 countries. But the information on the role played by them and the impact of their work is scattered in literature. The aim of this study was to document that information at one place with a view to providing a fuller picture of the role of the CGIAR Centers in rebuilding agriculture in both man-made and natural disaster situations.

Single copies of "Healing Wounds" may be requested free of charge from the Head, Communication, Documentation and Information Services (s.varma@CGIAR.ORG), ICARDA, Aleppo, Syria.

Supplemental Irrigation in Iran: Increasing and Stabilizing Wheat Yield in Rainfed Highlands. On-Farm Water Husbandry Research Report Series No.5. 2005. Tavakoli, A.R., Oweis, T., Ferri, F., Haghighati, A., Belson, V., Pala, M.,; Siadat, H., and Ketata, H. xii + 46 pp. ISBN: 92-9127-166-5

This report presents results of three studies conducted in Iran by researchers from ICARDA and the Dryland Research Institute of Iran during 1995-2002 aimed at increasing and stabilizing rainfed wheat production using supplemental irrigation. The use of supplemental irrigation, in addition to various levels of fertilizer use, increased the yield and yield-stability of wheat in the study areas. The report will be very useful to researchers, extensionists and farmers who are struggling to improve water productivity, especially in the dry areas.
Price: US$10.

Assessing On-Farm Water-Use Efficiency: A New Approach. 2005. Shideed, K., Oweis, T., Gabr, M., and Osman, M. xiv + 86 pp. ISBN: 92-9127-163-X.

This report presents research results from six case studies conducted by ICARDA, the United Nations Economic Commission for Western Asia and national scientists in Egypt, Jordan, Iraq, and Syria, which led to the development of a new empirical approach for assessing on-farm water-use efficiency. The studies reveal that even in the dry areas, which are characterized by water scarcity, available water is not used efficiently for agricultural production due to farmers' practices and prevailing policies on water. The report will be useful to policy makers, researchers and farmers in the dry areas who are trying to increase water productivity. Price: US$10.

Rainfed Wheat Productivity with Supplemental Irrigation in Al-Hasakeh, Northern Syria. On-Farm Water Husbandry Research Report Series No. 4. 2005. Somme, G., Oweis, T., El Omar, F., Hachum, A., Shayeb, R., and Jooni, N. 31 pp. ISBN: 92-9127-162-2.

This report presents the results of a six-year study on supplemental irrigation for improving water-use efficiency and productivity of wheat in Al-Hasakeh governorate, northern Syria. One of the most important findings of the research is that about half of supplemental irrigation amounts currently applied may be saved with only 10-15 % yield loss. The saved water may be applied to new rainfed crops with substantial yield increases. The findings and recommendations of this work have important policy implications which, if addressed, will benefit the farmers in rainfed areas in Syria and other similar environments in CWANA. Price: US$ 10.00.

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