

# ICARDA *Caravan*

Issue No. 3 Spring/Summer 1996



## *Review of dryland agriculture*

### *In this issue:*

#### ***Saving the range***

*This Bedouin woman lives on the range, or step-pelands, of West Asia. Her future is gravely threatened by overgrazing and overcropping. But is it hopeless? No! Read our report—page 14.*

#### ***Hot air from ICARDA!***

*Simulating the sirocco for Morocco*

#### ***Farmer to farmer***

*A new type of traveling workshop in Jordan*

#### ***More food from barley***

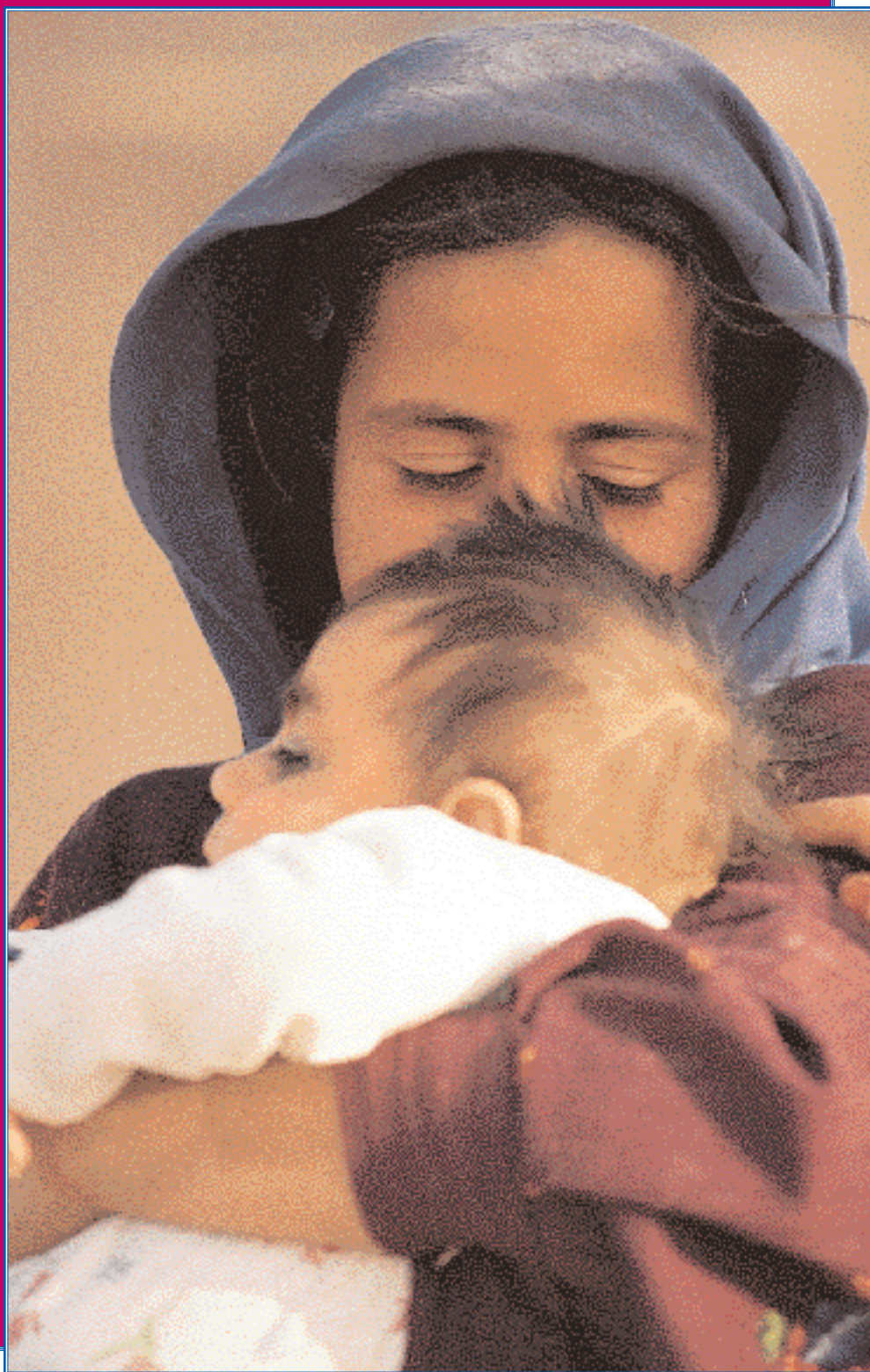
*How Ecuadorean women are helping develop barley foods*

#### ***Winter chickpea***

*Helping farmers fight the blight*

#### ***Feed legumes***

*Feed legumes have a field day*



## From the Director General

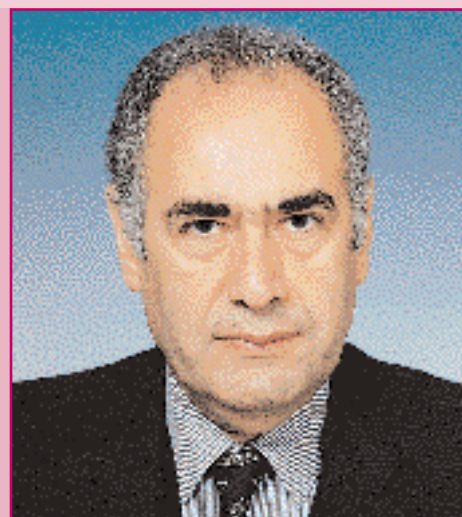
**T**he use of livestock products in people's diets is sharply increasing. For example, the Food and Agriculture Organization (FAO) of the United Nations reports that the average Jordanian derived 325 k/cal daily from animal sources in 1988/90, against 254 at the end of the 1960s; the amount from plant sources actually dropped. This does not mean that people in Jordan, or other countries with similar figures, are eating enormous amounts of meat, which is still expensive for most people in West Asia and North Africa (WANA). Animals also provide dairy products such as milk and cheese; important sources of protein and calcium. The figure represents a better diet.

Still, if animals are to feed people, something must feed the animals. ICARDA's research indicates that, by the year 2020, assuming a 3% increase in crop production, 13 out of 18 countries (including Jordan) in West Asia and North Africa would face a deficit in domestic feed production. In some

cases, the deficit may be quite serious: Yemen, Lebanon, Iran, Algeria and Afghanistan would all face a shortfall of over 10%. If crop production does not increase by 3%, the outlook is far worse.

The basic reason is simple: more people are demanding more livestock products per head, driving up livestock numbers and thus stocking rates. (To return to FAO figures, the number of sheep in Syria rose from 4.8 million to 12.2 million head between 1972 and 1992; in Jordan, from 0.6 million to 1.3 million.) This is seriously affecting feed supplies. Pasture grazing provided 34% of the ruminant diet in Syria 25 years ago; by 1992 it was 18%, and Tunisia, Turkey and other countries have seen similar developments. Crop residues and concentrates are taking over.

Does this mean that crop residues and concentrates are cheaper, better sources of feed? Or, is there a problem with pasture availability? It looks more like the latter. Overgrazing, inappropri-



ate cultivation and other factors have rendered useless about 9 million sq. km. of the world's drylands since the end of the Second World War. Rangeland, or steppe, used by pastoralists, accounts for a significant percentage of this; and may now provide only 5-10% of the small ruminants' diet in the region; 40 years ago it provided about 60-80%. Given the shift towards livestock products as part of a rising standard of liv-

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### Cover story: the battle for the steppe

Desertification is a creeping menace. Year by year, more and more marginal land is being swallowed up through loss of biodiversity and topsoil. What is the future of those who, like this Bedouin woman, (right), rely on the steppe or rangelands for their livelihood? And if these lands continue to decline, where will cities get sources of protein—milk, cheese and meat? But ICARDA and its partners are fighting back.



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**S**preading the word on forage legumes: a successful briefing for farmers

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ing, we cannot allow this resource to be further damaged.

ICARDA is helping to protect rangelands in several ways. For example, in cooperation with farmers and national programs, the Center is developing conservation and rehabilitation technology, using saltbushes and locally-adapted medic species.

However, much of the answer may lie off the steppe and on the farm. Crop/livestock integration is an important part of agricultural research in the WANA region. ICARDA encourages rotation with feed legumes, providing feed as well as raising cereal yields; and makes straw quality an integral part of its barley breeding. But, in WANA, pastoralists interact with settled agriculture at the steppe margin to the extent that it can be hard to tell where one farming system ends and the other begins. So we monitor land use and vegetation, using modern tools like Geographic Information Systems (GIS). And at the same time we talk to land users to find out why overgrazing, inappropriate cereal cultivation and other damaging activities occur. After all, no one destroys his working capital deliberately.

All this requires a multidisciplinary approach. We feel that this is a strength of ICARDA. We are confident that, given patience and a broad understanding of the problems, the "feed gap" projected for 2020 can be abridged.

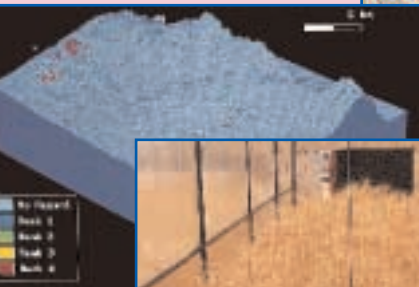
**Prof. Dr Adel El-Beltagy**  
**Director General**



***Below: checking out rangeland from the sky, page 17.***



***Above: farmer to farmer—on the move! See page 10.***



***Left: Hot air from ICARDA. The sirocco simulator can help fight drought, page 8***

## **About ICARDA**

*Established in 1977, the International Center for Agricultural Research in the Dry Areas (ICARDA) is governed by an independent Board of Trustees. Based at Aleppo, Syria, it is one of 16 centers supported by the Consultative Group on International Agricultural Research (CGIAR), which is an international group of representatives of donor agencies, eminent agricultural scientists, and institutional administrators from developed and developing countries who guide and support its work.*

*The CGIAR seeks to enhance and sustain food production and, at the same time, improve socioeconomic conditions of people, through strengthening national research systems in developing countries.*

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

*The Center has a world responsibility for the improvement of barley, lentil, and faba bean, and a regional responsibility in West Asia and North Africa for the improvement of wheat, chickpea, forage and pasture crops—with emphasis on rangeland improvement and small ruminant management and nutrition—and of the farming systems associated with them. The full scope of ICARDA's activities can be appreciated only when account is taken of the cooperative research carried out with many countries in West Asia and North Africa.*

*The results of research are transferred through cooperation with national and regional research institutions, with universities and ministries of agriculture, and through the technical assistance and training that the Center provides. A range of training programs is offered and these efforts are supported by seminars, publications, and specialized information services.*

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# The race to the future

We can feed the world. But we had better get on with it, says former UN Ambassador



Support for agricultural development and research is declining at an alarming rate just when it is needed most. And we are losing ground right now—ground that will have to be made up later. That was the message from former United States Ambassador to the United Nations Robert O. Blake, who gave the keynote address at ICARDA's annual Presentation Day on 21 April 1996.

"Despite the enormous growth in global population, I believe we can feed the world. I am an optimist," he told the audience.

But he expressed horror at the relative decline in funding for agricultural research and stressed the crucial importance of institutions such as ICARDA in safeguarding the future. "Only by the best science, and the best systems for natural-resources protection, will the problems be solved."

Ambassador Blake said that he was very worried by decreasing support to agriculture. There was a feeling that agriculture was somehow old-fashioned. ICARDA needed to find the best way to work with existing partners, and to find new ones, such as the private sector and the business community, especially with regard to biotechnology. Yet, in fact, farmers had little to do with the private sector; it was not profitable for business.

The Director General, Prof. Dr Adel El-Beltagy, set a new tradition by inviting a distinguished guest to give the keynote address for Presentation Day this year. Ambassador Blake is indeed distinguished, having been US Ambassador not only to the United Nations but also to France. Today he chairs the CGIAR's Committee on Agricultural Sustainability for the Developing Countries. He also co-chairs a special committee of the CGIAR which deals with NGO collaboration.

He is also keenly interested in participatory research. "It is important to remember one basic fact; that all our efforts to feed the world depend on serving the farmer," he told his audience. "It's a point that is too often lost, but it's the basis for all that ICARDA does." It was, he said, important to work on these problems with farmers; a good starting point might be to realise who we were actually deal-

On 21 April 1996, ICARDA paid tribute to the memory of Dr Harry S. Darling CBE, its first Director General, by dedicating a new executive conference room to his memory. The ceremony took place with his widow, Vera, and his daughter Ruth Triffitt in attendance. Dr Darling, who died on 4 August 1995 aged 81, led ICARDA from its inception in 1977 until 1981.

Born in Lurgan, Northern Ireland, Dr Darling obtained his BSc in Zoology and B.Agr. in Agricultural Zoology at Queen's University, Belfast. His PhD was from Wye College, of which he was later to be Director of Hop Research and eventually Principal.

## ICARDA honors Dr Darling

*Dr Harry S. Darling CBE, ICARDA's first Director-General, who died last year, was recently remembered in a dedication ceremony.*

During the 1960s he was Dean of Agriculture, Director of the Institute of Agricultural Research and

*Continued opposite*



*Mrs Darling opens the executive conference room, accompanied by the Chair of ICARDA's Board of Trustees, Dr Alfred Bronniman.*



ing with. Women in agriculture were important. He quoted a colleague's statement: "I'd like to describe to you the life of the African farmer and her husband."

"Anything you develop that the farmers don't like, they'll send it back. We may learn as much from what farmers have rejected as from what they have accepted." He was impressed with ICARDA's attitude in this regard.

Ambassador Blake said that it was important to talk about the problems in a global context. "You all know that, by 2020, the world's population will have grown by 40%, from 5.5 to 8 billion. The FAO thinks it could be 10 billion. Of this growth, 94% will occur in the developing world." And the Middle East will grow by 100 million.

He referred to 'hidden hunger.' "Today, there are about 800 m malnourished people, who are too poor to buy the food they need. A third of the world's school-

children are malnourished.

"But there is a growing number of prosperous people. India's middle class is the size of the population of France. They will demand better food."

Globally, said Ambassador Blake, we must produce 64% more food in 25 years. In many countries, an increase of 100% would be needed; in Africa, growth in food production had lagged behind that of population for the 16th year in a row when in fact it needs to grow at 5% a year. He believed that ICARDA was addressing this.

Farmers would have to grow this extra food with less land and less water. Today about 50% of the world's food was grown on irrigated land, yet the actual area was decreasing due to waterlogging and salinity. Moreover water would be in increasing demand from cities and industry, and the demand would be so great

that agriculture could only lose.

There was no doubt that these questions were becoming very urgent. Ambassador Blake pointed out that shortages had driven up wheat prices by 100% in recent months. World food stocks were at their lowest level since 1945. And all but two of the countries in the region in which ICARDA works are food-deficit countries.

"But there is good news, and that's why you're here. Science is developing plants that use less, and less good, water. Ways are being

found for better exploitation of water; for example, water harvesting. And we are learning how to deliver water exactly when and where it is needed. ICARDA and its partners are doing a lot, but they need to double or triple their efforts.

"Work for more support to research, especially to ICARDA; it will need to double or triple. And work for peace. War and civil strife are the worst enemies of the poor."

And he stressed the importance of joint water management—"without which," he said, "peace may prove elusive." ■



### The Three Pillars of Wisdom

The three pillars of agricultural research: science (left), finance (right) and wisdom! Science and finance are represented respectively by Dr Salvatore Ceccarelli, barley breeder and Acting Head of ICARDA's Germplasm Program; and by John Noisette, Director of Finance and Administration. Between them is wisdom; Dr Robert Havener, who spent two weeks at ICARDA in April. Dr Havener has spent nearly two decades in development worldwide, and has served on the Board of Trustees of ICARDA; he

was instrumental in the Center's inception. He has also been acting Director General or Director General of two other international Centers, as well as holding other very senior appointments. In 1985 he became President and Chief Executive Officer of Winrock International Institute for Agricultural Development. He is currently Board of Trustees Chairman of CIAT, of which he has also been Acting Director General. What are the three pillars doing? Demonstrating a fourth pillar—indigenous knowledge. ■

“ He will always be remembered for his dedication to his work—and for his good human relationships, calmness and tact. ”

then Deputy Vice-Chancellor of Ahmadu Bello University in Zaria, Nigeria. He was made a Commander of the British Empire in 1967.

It fell to Dr Darling, as ICARDA's first leader, to interpret the Center's mandate and give its research form and direction. He recruited a dedicated staff; a number of those originally recruited by Dr Darling remained with ICARDA. Dr Darling established appropriate relationships with donor agencies to enlist their support for the Center. And he built up good working relationships with the host

countries, an essential component of ICARDA's success.

By the time he retired in 1981, the Center had grown into a strong, healthy institution and a focal point for much of the agricultural research in the region.

He continued to take an interest in ICARDA in later years.

Dr Darling was a noted researcher and administrator. He will always be remembered for his dedication to his work—and for his good human relationships, calmness and tact. ■

# ICARDA to step up collaboration following Minister's visit

ICARDA is to strengthen its collaboration with the Palestinian Authority in agricultural research, with the possibility of joint projects in integrated crop/livestock development and proper land management and conservation.

ICARDA is also to strengthen its support to agricultural research by the Authority in a number of areas. Germplasm for testing will be supplied at once, and other cooperation will include training in germplasm conservation and documentation, conservation of marginal land and rangeland,

and water-harvesting.

These developments follow a visit to ICARDA on 6-7 August by a delegation led by the Minister of Agriculture of the Palestinian Authority, H.E. Dr Abdul Jawad Al Saleh. He was accompanied by Dr Mahmoud S. Sultan, Director, Palestinian Institute for Arid Land Studies; Mr Shaker S.

Joudeh, Director General, Extension and Training; Mr Rushdi Mushmesh, Director, Field Crops Department; and Mr Hamdallah Al-Hamdallah, Head of Foreign Affairs. The delegation held discussions with the Director General, Prof. Dr Adel El-Beltagy, and members of ICARDA staff. The discussions proved fruitful, and identified a wide range of areas of cooperation. ICARDA expressed its willingness to support the Palestinian Authority in its efforts to rehabilitate its research program. Direct and immediate support will include the supply of germplasm of legumes and cereals, which the Authority wants to field-test under local conditions.

There will also be large quantities of the most promising released cultivars in the region, including wheat, barley, lentils and vetches.

Other support to be provided by ICARDA in the very near future will be in the area of human resources development.

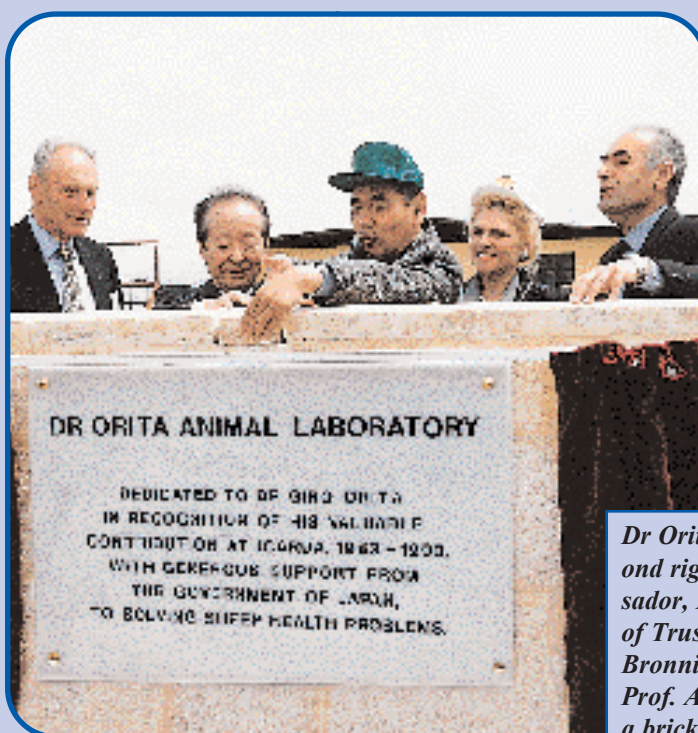
ICARDA promised the Minister that it would accord high priority to Palestinian researchers for general training, plus individual training



## New laboratory named after Japanese veterinarian

A new animal health laboratory being built at ICARDA has been named after Dr Giro Orita, former visiting veterinarian at the Center, in recognition of his distinguished service. Dr Orita, who has over 30 years' experience of working on animal health in Syria, has now retired but is still closely connected with the Center.

Dr Orita was one of a team of veterinarians who arrived in the country in October 1964 in response to a request to the Japanese Government from Syria's Ministry of Agriculture. When the Japanese team completed its mission in 1968, the Syrian Government invited Dr Orita to continue his work. Over the next



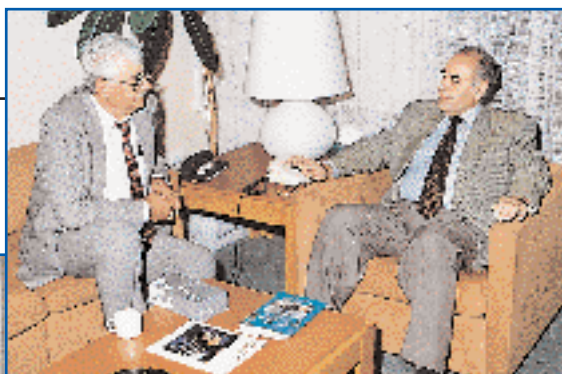
few years, he fostered collaboration in animal health research between Japan and Syria.

In 1975 the General Establishment for Cattle was set up in Syria. Dr Orita was appointed as consultant to its Director General, advising on animal health. He continued this work up to 1981, when a laboratory for cattle pathology was established at Hama. The Japanese Government provided support to both establishments.

*Dr Orita (second left) and Mrs Orita (second right) joined the Japanese Ambassador, Mr Tomio Uchida (center), Board of Trustees Chairman Dr Alfred Bronniman (left) and ICARDA's DG Prof. Adel El-Beltagy (right) in cementing a brick in the foundation wall of the new animal health laboratory.*



# with Palestine



(Above:) HE Abdul Jawad Al Saleh, Minister of Agriculture for the Palestinian Authority (left), met ICARDA Director General Prof. Dr Adel El-Beltagy. (Left): ICARDA's Andreas Antypas (pointing at screen) demonstrated some of ICARDA's computer technology to the Minister and other members of the delegation including Mr Hamdallah Al-Hamdallah (at back) and Mr Shaker S. Joudeh (beside Minister). With them are Mr C.K. Rao (left), Dr Mohan Saxena (second left) and Dr Nasri Haddad (right) of ICARDA.

in germplasm conservation and documentation, conservation of marginal land and rangeland, and water-harvesting. Other activities planned in the short term

include in-country training in Palestine and Jordan in data collection, improved seed production and other matters. Funding support from the World Bank and

the Swiss Government will help ICARDA in meeting these commitments.

In the long term, project proposals for collaborative activities will be submitted

to donors; for example, for integrated crop/livestock development and proper land management and conservation.

The visit ended with the presentation of a commemorative gift to the Minister by Prof. Dr El-Beltagy. Replying, the Minister said that the Palestinian Authority's agricultural research was starting from zero, but the visit had been an excellent, and unique, opportunity to seek ways to develop Palestinian agriculture.

ICARDA was, he said, a distinguished Center with a good reputation, and he thought Palestine would benefit from the relationship.

He thanked the Director General for the goodwill and staff time the delegation enjoyed during its visit. ■

From 1981, Dr Orita collaborated closely with ICARDA in research on small-ruminant health. Later, when ICARDA asked the Japanese Government to assist it in the development of small-ruminant pathology research, Dr Orita was delegated as a visiting veterinarian through the Japan International Cooperation Agency (JICA). He left ICARDA in 1990, but has continued to promote the relationship between ICARDA and Japanese organizations.

In 1985 Dr Orita was awarded the Syrian Medal of Distinction (second rank) by the Minister of Culture.

The formal dedication of the Orita Animal Health Laboratory took place at the Center's Sheep Unit on 21 April. ■

*ICARDA's parent body, the Consultative Group on International Agricultural Research (CGIAR), recently sent a delegation of young scientists from ICARDA and its sister Centers to help man the Gardening for Food Around the World exhibition at the Land/ EPCOT Center, Disney World, in Florida. The representatives also received training in public relations and communications techniques. Fears that they would end up wearing Mickey Mouse ears were quickly dispelled, as they adopted national dress instead! Back row from left; Imad Mahmoud (ICARDA), Soli Prijono (CIFOR), Margarita Mauro (CIMMYT), Gina Zarasadias (IRRI), Afif Dakermanji (ICARDA). Foreground from left; Sudi Rao (ICRISAT), Wale Adekunle (IITA) and Ronald French (CIP). The exhibition and the collaboration with Disney was a great success, but national dress did have its disadvantages. "People kept asking if we'd been hired for the exhibition," says Imad Mahmoud. ■*



# Better trials...from the scrapyards

*Researchers from Morocco's national program wanted to select lines that will resist drought—and the sirocco, the fierce, dry wind which sweeps over North Africa. They got together with ICARDA, an electric motor, a domestic oil heater, and an old truck radiator. The result? The INRA/ICARDA Mk.1 Sustainable Sirocco Simulator! But it wasn't as simple as that.*

It started with Dr Hassan Ouabbou of the Institut de la Recherche Agronomique (INRA). Some time ago he traveled around Morocco with ICARDA's cereal plant physiologist Dr John Peacock. The two men talked long and hard about the problems of breeding for heat stress. Dr Ouabbou was at that time working on his PhD thesis at Kansas State University in the United States. It was titled *Physiological aspects of recovery and evaluation of wheat during high temperature stress*, an appropriate field for a scientist in a country where drought and heat can be devastating.

Dr Ouabbou, who is in the Agronomy Department at INRA's regional center at Settat, described how, in certain conditions, growth in cereals completely stopped at the grain-filling stage. It was not clear why. What was needed was a way of simulating heat stress so that the problem could be studied and sources of resistance found.

The challenge had a familiar ring to it. Dr Peacock had been working on the simulation of heat stress and its effects on seedling development. In some conditions, seedling development simply stopped, and Dr Peacock wondered what was really happening. He had got together with ICARDA engineer Peter Eichhorn and Dr Mahalakshmi, a visiting scientist from ICRISAT in India, and together they modified a system which Dr Peacock had developed earlier at the University of Arizona for subjecting seedlings to this type of stress. Using this, the problem could be studied.

These experiments, and earlier ones in Arizona and India, proved successful. "What we found was that heat shock

prevented the products of photosynthesis from reaching the root system," he explains. "Put simply, a plant has two basic parts to it. One is the source and the other is the sink. The source develops energy; the sink uses it. In extreme heat, the products—carbohydrates—find their journey between source and sink blocked, possibly by proteins which coagulate in the phloem as a result of the high temperatures and block the sieve plates.

"The circumstances under which this coagulation occurs is genetically governed. This means that we can look for sources of resistance; that is, either a higher coagulation temperature or something that stops blockage."

While doing this research, Dr Peacock found that the principle of growth stopping because of a blockage between source and sink had been described by others. But a long time ago. "Cut a ring of bark off a tree and it will die, but not at once. That's because the bark provides a route between source and sink. When it is removed and the route is blocked, the tree roots starve and eventually die. Before that happens, a bulge will develop at the edge of the cut bark. That's the products of photosynthesis trying to get through.

"This phenomenon was, in fact, ob-

By Mike Robbins

served by Marcello Malpighi in 1675 and by the father of modern plant physiology, Stephen Hales, in 1727. Perhaps we should use the indigenous knowledge of the scientific community..."

The stimulus for the next move came from Dr Ouabbou. If it had been possible to simulate heat-stress in seedlings, and find out why their growth was stopping, could not the same be done for the grain-filling stage?

The problem was that Morocco, and the other North African countries, had a special constraint. The sirocco.



***The simulator uses a line-source system, also used in water-use efficiency trials. In those, a pipe—the water source—runs at a right angle to the plots so that there a graduated difference in the distance between the water and the source. The sirocco simulator will do the same with air.***

"We're not just talking about heat here," says Dr Peacock. "Hassan and I wondered if the aridity of this wind was a factor. It's important to find out, because there are at least two stresses



that could be stopping the growth at that stage. We need to know what it is, so that eventually we will be able to map genes for thermotolerance."

The first possible cause would be overheating of the leaves and their photosynthetic apparatus. "What happens is that a combination of heat and aridity could disrupt the plant's cooling system. The plant then stops producing energy or photosynthates.

"But what about, again, a blockage between source and sink?"

When the plant reaches the grain-

filling stage, explains Dr Peacock, the head which is producing seeds is now the sink and there is a heavy demand for the "fuel supply." It is possible, he says, that once again the proteins are coagulating because of sheer heat stress, accentuated by the failure of the plant's air-conditioning system. "If this is the case, the aridity of the sirocco is not a factor. The only way to find out is to perform trials in the field which test for performance under heat and wind and aridity." Hence the need for a machine which could simulate heat, wind speed and relative humidity. In the field!

The problem was put to Peter Eichhorn, who was intrigued. Funding problems in 1993 meant that ICARDA was unable to do anything about it at the time, but in the spring of 1996 Mr Eichhorn built a prototype. And Dr Ouabbou came from Morocco to assist with its development. They were joined by Dr Mohamed Iskandar from Egypt; an agronomist, he carries out research for the Egyptian national program in the Northern Sinai. Egypt also faces fierce onshore winds between Marsa Matrouha and El

Arish. His visit was arranged by ICARDA's Nile Valley and Red Sea Regional Program (NVRSRP).

The four-man team made some modifications. The original machine drew hot water from the domestic heating system and was, in any case, all-electric. Dr Ouabbou wanted a machine that would function in the field. The design that emerged burns diesel-oil to heat water, which is then circulated through a truck radiator. A truck fan driven by an electric motor blows through this and sends a pretty good sirocco down through a plastic tunnel, in which a sprinkler system will be calibrated to simulate different levels of relative humidity. Electricity will still be needed

to run the electric motors for the fan and circulation pump, but the power consumption will be low, so that a small generator can be used to run one or more machines in the field.

The machine is being calibrated with the help of data on wind speed and relative humidity for Morocco supplied by Dr Ouabbou. The temperature data was collected by ICARDA agroclimatologist Dr Wolfgang Goebel. The data being used stretches back over 30 years. The next step will be for John Peacock and Peter Eichhorn to thoroughly field-test it before the Mk II version is developed in North Africa.

The simulator should not only answer Dr Peacock's questions about the actual physiological process of heat-stress at grain-filling. It should also speed up breeding trials. Droughts in the Maghreb are all too frequent, but they do not happen every year and it follows that testing for drought-resistance has hitherto been a longish process.

The simulator is also a piece of appropriate technology which national programs will be able to build for themselves. The second prototype had a notional cost of around \$US2,500, but this was because an expensive type of boiler was used; it just happened to be available. A more normal heat source would be an ordinary domestic diesel-burning water-heater, of a type which is in common use all over the Maghreb and Mashreq regions. The motor for the fan came from an old high-pressure pump, the fan and radiator from a scrapped generator. As for the fuel, diesel is sometimes subsidized in the region; in Syria, for example, it is markedly cheaper than ordinary petroleum.

As head of ICARDA's agriculture machinery workshop, Peter Eichhorn is well used to being asked for this sort of solution. He and his staff have helped develop appropriate technology for (for example) seed sweepers and pod-threshers.

"National programs are often short of funds," says Mr Eichhorn, "and this can be a constraint to research work. Machines like the simulator can greatly reduce this constraint. It's not a miracle solution; certain standards have to be observed. Even so, this is something national programs can put together for themselves." ■



**Dr Hassan Ouabbou (left) and Dr Mohamed Iskandar with the sirocco simulator. The boiler, at right, was a spare; a more normal heat source would be an ordinary domestic diesel-burning water-heater, of a type which is in common use all over the Maghreb and Mashreq regions.**



**The motor for the fan came from an old high-pressure pump, the fan and radiator from a scrapped generator.**

# *Farmer to farmer—on the move*

*ICARDA has long organized traveling workshops, but for scientists, not for farmers. Now this is changing.*

**By Nasri Haddad**

**I**CARDA has used traveling workshops for scientists since the late 1970s. In fact, we really invented them. They are a useful method for joint evaluation of research results, discussion of future projects and general comparison of experiences.

The ICARDA Mashreq-Maghreb (M&M) project recently organized a highly successful traveling workshop in Jordan—not for scientists, but for 15 farmers/sheep owners from five countries. They came from Iraq (3 farmers), Syria (2), Palestine (2), Lebanon (2) and Jordan (6).

The M&M Project, centered on ICARDA's regional office in Amman, is designed to pull together the research of scientists in national programs in both the Mashreq and the Maghreb. It is implemented by the national programs in Algeria, Iraq, Jordan, Lebanon, Morocco, Syria and Tunisia. The project is sponsored by the Arab Fund for Economic and Social Development (AFESD) and the International Fund for Agricultural Development, with coordination and technical backup from ICARDA and IFPRI (International Food Policy Research Institute, Washington, D.C.).

The project involves farmers in the planning of its activities, organizes meetings with them to discuss the project workplans, and responds to their needs and views. It also involves them in the evaluation of results and selection of germplasm, and tries to understand their production strategy and decision-making process.

One major activity of the project is to conduct adaptive research on farmers' fields with their full participation. This is implemented by a multidisciplinary

team including researchers from various disciplines, extensionists and farmers.

Traveling workshops fit well into this working method. Up to now they have usually been designed for scientists and technicians. However, this time M&M decided to involve farmers, encouraging them to visit other countries, meet their colleagues and discuss with them their fieldwork in relation to the project.



*Farmers from five countries—Iraq, Syria, Palestine, Lebanon and Jordan—participated in the traveling workshop organized by ICARDA's West Asia Regional Program in Jordan.*

**T**he program, which ran from 12 to 16 April, was designed to allow farmers as much time as possible in the field while spending evenings in the houses of Jordanian colleagues, giving maximum interaction between them.

"I am excited about this experience," says Mr. Mamdouh, the M&M Project's National Coordinator in Jordan. "I was a little worried at the beginning because I couldn't predict what sort of group of farmers we would have, and how they would get on. But they developed a very friendly relationship with each other right from the beginning, and became close friends.

"We learned a lot from them, too. They talked, for example, about feed subsidy in Jordan and its effect on barley farmers, and raised several questions on policy and how it could be adjusted to encourage production; they mentioned crop insurance; and they were critical of rangeland and grazing policies." In fact, the tour finished with a meeting with His Excellency Dr Mustafa Shuneikat, Jordan's Minister of Agriculture. He discussed their visit and their impressions with them and later thanked ICARDA for organizing what is, so far, a unique workshop in the region.

The Syrian, Iraqi and Lebanese farmers liked the Rum barley cultivar grown in Jordan, which is tall but non-lodging and is high-yielding. They requested seed. The Palestinian farmers talked about their own vetch cultivars, which has higher dry-matter yield than those they saw in Jordan; one of them, Abu Ayed, promised to send some seed to the others when he got back.

Iraqi farmer Abu Imad said he thought vetch had limited potential for grazing at present, but showed interest in the production of hay bales from vetch, or barley, or barley/vetch mixtures. He thought that in Iraq's case, due to the system of land tenure and the tradition of free grazing on stubble, hay bales or straw bales could be the best way of increasing forage production. His compatriot, Abu Ammar, encouraged the others to look into the Iraqi-developed by-product feed blocks as a supplementary feed. This technology has been very successful in Iraq, and ICARDA's M&M Project is promoting it in the region as a whole (see Caravan No. 2).

The participants also got plenty of



ideas from the host country. For example, they saw a small electric milk-shaking unit used by a farmer in South Jordan, saving time and labor. They visited plastic houses where vegetables are produced, and saw for the first time the drip-irrigation system being used in the Jordan valley. They also visited citrus and banana farms, a new experience for them.

Farmers spent some time talking about the early weaning of lambs.

Jordanian and Syrian farmers have been applying this technology because they want to increase milk production. In Iraq and Lebanon, however, they are more interested in meat production, and prefer to use the sponge and PSMG hormone so as to raise twinning rates. Nevertheless, they were attracted by the idea of early weaning and said they would look into it when they got home.

The farmers themselves said the trip had been very successful—which was

also ICARDA's impression. They said they valued the chance to see what other farmers in the region are doing, get new ideas and gain confidence in their own work.

The visit broadened their horizons, opened doors to new ideas and technologies and gave them the chance to get to know new friends. They intend to keep in touch with each other and ICARDA is looking forward to future cooperation with them. ■

## Winter chickpea: this is how, farmers told

*Farmers using the new winter chickpea technology can run into trouble if they don't use the right seed and agronomic packages. But the information is being brought to them as quickly as possible.*



*A farmer (center) discusses winter chickpea with breeder Abdul Masieh (left) and colleague.*

By  
Mike Robbins

It's a hot June day at Tel Rafara't, around 35 km north of Aleppo. About 30 farmers from the surrounding area are standing in a plot of healthy chickpea. Over to one side is another plot of chickpea, but this one is not healthy at all. An ICARDA scientist and a colleague from the local Ministry office are explaining why. The good plot is a recommended cultivar of winter chickpea. The bad one is one of what someone thought was winter chickpea when they planted it. It may have been an early cultivar, now not recommended. It may not have been winter chickpea at all.

Winter chickpea really can produce twice as much as farmers' spring cultivars (see Caravan No. 1), but lately farmers have been concerned by a resurgence of ascochyta blight. This was the menace that ICARDA and its sister Center ICRISAT set out to defeat in order to make winter planting safe, so that the better soil moisture could be exploited. The problem seems to be arising because farmers have been buying unidentified seed off their neighbors, instead of obtaining good seed from the Ministry, which has plenty.

The field day, organized by the staff of the Extension Directorate of the Ministry of Agriculture and Agrarian Reform, was to look at on-farm trials of winter chickpea. Nabil Trabulsi and Gaby Khalaf of ICARDA's Germplasm Program joined them. A number of extension and other staff from the Ministry also took part, including Abdul Rahman Mekki of the Tel Rafara't office, as did chickpea breeder Abdul Masieh of the Directorate of the Scientific

Agriculture Research, Damascus.

Mr Masieh has been working closely with ICARDA on winter chickpea technology. He and the two ICARDA experts expressed concern that winter chickpea was getting an unnecessarily bad name. The problem has been aggravated by high rainfall this year, and 100% humidity in March and most part of April; this is most unusual. In fact, resistant cultivars for winter chickpea have been released; the problem is that the right cultivars and production practices are not being used.

To prove the point, farmers were shown plots of Ghab 2 and Ghab 3—along with a local cultivar of the sort that farmers are buying off each other under the assumption that it is a cultivar of winter chickpea. Even if it is, it is still untreated seed and may be Ghab 1, which the Ministry no longer recommends. It is known that this cultivar has become susceptible to ascochyta blight through the appearance of a new strain of the disease.

Next to the diseased plot were Ghab 2 and Ghab 3, in excellent condition. Use these, the Extension Directorate staff told the farmers, to benefit from yields of up to 1.5 t/ha, against 0.6 t/ha from local cultivars of spring chickpea.

"They must still use good seed even if it's of the right cultivars," says Mr Trabulsi. "It must be treated, or there is still some risk of ascochyta blight. But ICARDA's seed is treated, of course, and the Ministry can supply treated seed." The Extension Directorate is continuing its efforts to inform farmers of the true situation. ■

## More food from barley

*In the modern world, barley has had two roles: malting barley, used in the brewing industry, and subsistence barley, used as food and feed in the poorer areas. But that could be changing. And a partnership between ICARDA, the Ecuadorean national research program, farmers, private industry and even television is helping to bring about the change.*

**I**n Ecuador and Peru, barley food products are appearing in urban supermarkets. For Ecuador, it means less reliance on wheat imports, better, cheaper food for the urban population, and more cash in farmers' pockets.

Dr Hugo Vivar, Coordinator of ICARDA's Latin America Regional Program (LARP), noticed the change about three years ago through his work with the Ecuadorean national program, INIAP (Instituto Nacional de Investigación Agropecuaria). For a number of years, ICARDA, through LARP, has been breeding and supplying new barley lines which are high-yielding and resistant to pests and diseases, and working with the national programs to implement suitable agronomic packages for the lines. ICARDA has a global mandate for barley. LARP's barley-breeding program is run in collaboration with CIMMYT.

"In the past, barley as food was associated with high, remote mountains and poverty," says Dr Vivar. "You'd never have found it in a supermarket in the capital. But with rural-urban migration, people who have come to the cities do want these products. They're familiar, and they're cheaper than, say, white bread or Quaker Oats."

"The change is a good thing for several reasons. First of all, large areas have been driven out of wheat production because of the challenge from imported wheat, but the rising urban demand for barley means it's



Hugo Vivar

*A farmer in Southern Ecuador with hull-less barley, part of the IINIAP/ICARDA breeding program.*

economic to bring them back into production - for barley. This means a better living for farmers, putting cash in their pockets but without wrecking the subsistence base. After all, they still depend heavily on bar-

ley themselves. This is also happening in Peru. Second, it helps the balance of payments. It doesn't reduce the import bill much, but it can only be good. And third, it has nutritional benefits."

## Spreading the word from farmer to farmer

*How can farmers adopt new technology if they don't know about it? ICARDA's scientists have been showing their products.*

**By Jouhayna Issa**

**T**here is no point in doing agricultural research if the results do not reach, and benefit, the farmer. So, during April 1996, ICARDA and its Syrian partners held a series of field days to make sure it does. The three-day Study Tour in northern Syria was designed to show farmers and extension agents from both sides of the country what each group was doing in collaboration with ICARDA. This three-way participation turned out to be an excellent opportunity for exchange of ideas and experience, with farmers helping ICARDA to persuade other farmers of the benefits of crop rotations.

More than 50 participants attended the first day, at ICARDA's research station at Tel Hadya, 35 km south of Aleppo. The Center's Nerses Nersoyan led a tour of rotation experiments which have been running since 1984/85 and have been the basis for extending this type of research to other countries. The participants also saw the farm machinery needed if a farmer was interested in growing legumes in those rotations. They saw an Edlebi Company roller

to level the land and a Kashishian Company cutterbar to cut the legume crop when mature, both locally manufactured in Aleppo in collaboration with ICARDA.

The following day, at El Bab, 60 km northeast of Aleppo, there were some 70 participants. Professor Hisham Zainab, of Aleppo University, spoke of crop rotations, lack of which can cause falling cereals yield. He discussed the disadvantages of monoculture, and demonstrated how it encourages the development of serious pests such as the seed gall nematodes (*Anguina* spp.) which causes a disease called *Abou Alouwei*; this affects both barley and wheat crops, and is well known to farmers. The Professor assured them that following the rotations recommended by ICARDA with the support of the Research Directorates would help them eliminate these pests and diseases. Participants then moved to one of the field trials where vetch was growing, to watch an agricultural operation using two cutterbars; one the



This last factor, especially, caught Dr Vivar's attention, who has been collecting barley recipes for some time. When La Pradera heard this, it at once asked him for some. He supplied them; and put La Pradera in touch with INIAP, whose nutritionist, Dr Espin, was interested. She decided to run a workshop for women on cooking barley products, taking recipes Dr Vivar had collected from a number of sources, including Northern Europe and Japan, to see if they would be suitable for local tastes.

It was not just women from the high mountains, or Cordillera, who would benefit, she said; in large coastal cities like Guayaquil, people eat a lot of barley 'rice'; the barley is pearled, chopped into small pieces and cooked. So the idea of barley products isn't new. (Neither was the idea of compiling barley recipes; INIAP's own Elena Villacres had already been doing this).

The three-day course, which was financed by the German aid organization GTZ, took place at Santa Catalina research station, near the Ecuadorean capital, Quito, in early 1996. The participants, 25 in all, were respected figures in small rural communities and workers from the social services, for example orphanages.

One thing led to another. During the course, the women had fun with the barley recipes. New dishes were created. Ecuadorean television was intrigued, and ran a number of programs on the recipes on a popular daytime cookery show. And La Pradera, pleased with the implications for their products, paid for part of the printing of a 1000 copies of a booklet of recipes.

Dr Vivar is pleased too. "we'll get more land back into production, raise nutritional levels in the city, bring cash to the countryside and perhaps even see a growing labor market in food processing. Moreover, if

farmers have cash income from the crop, they can start using fertilizer. The majority don't now.

"It's also a story of partnership. There's the international research organization, ICARDA; the national program, INIAP; the people, testing novel recipes; the media, giving instruction through entertainment; and last but not least, industry, in this case La Pradera, which is playing a key role. I think this development is going to continue." ■



*Ready-to-use barley flour from Pradera.*

Kashishian, the other imported from Germany. The aim of the operation was to show the efficiency of the locally-manufactured cutterbar and to encourage farmers to buy and use it.

The Kamishly field day, held at the Hemo Agricultural Research Station 7 km from the city, drew yet more participants; about 85. George Malki and Samir Elias, from the Syrian Ministry of Agriculture, and Faik Bahhady and Scott Christiansen, from ICARDA, gave a detailed review of crop rotation trials, focusing on the effect of the legumes, be it pasture (medic), forage (vetch) or feed (lentil) legumes, and their effect on grain and straw production of the cereal. In this context, Mr Bahhady explained that although the fallow/wheat crop rotation would double wheat yield, net benefits are much better from a vetch/wheat rotation due to the returns from feeding livestock with the vetch. Although fallow is

rarely used now, any rotation was superior to continuous wheat. The speakers also addressed topics such as how the legumes improved the fertility and structure of the soil, making it easier to cultivate.

Dr Christiansen commented on the positive results achieved by ICARDA in cooperation with the Hemo Station. "These positive results were ICARDA's main motivation for its plan to implement similar trials in Lebanon and Algeria," he said. Three researchers from the American University of Beirut joined the field days to take a close look at the experimental trials implemented in Kamishly.

In the field plots it was easy to see very evident treatment differences. This drew much interest from farmers, who started asking questions of the scientists—to receive answers from other farmers. For example, the farmers in Kamishly doubted whether the rotation trials would be useful

in drier zones. But other farmers invited them to visit their fields in El Bab, where collaborative trials using barley/vetch rotations have been showing positive results under 250 mm annual precipitation for more than 10 years.

Towards the end of the field day, a discussion session was led by Ahmed Al-Kadri, Head of Hemo Research Center, and Hussein Bakkour, Assistant Director of Agriculture in Al-Hassakeh Province. During the discussion, many questions were raised by farmers on crop rotations, availability of machinery, the need for upright legume varieties (which resist lodging and remain erect for mechanical harvesting), and the urgent need to stimulate the livestock sector.

"We are very pleased by farmers' enthusiasm in their talks about the crop rotations," said Dr Christiansen. "What is particularly satisfying is the leaders of the farmers union

saying that they would like to organize additional field days at Hemo station to show more farmers the performance of the wheat following each of the various crops. With results like these, which can be seen with the naked eye, it makes it simple to convince farmers." ■

*Two-way traffic: Researchers Faik Bahhady of ICARDA (left) and Ahmed Al-Kadri of the Syrian national research program (fifth from right) swap notes with farmers.*



# The battle for the steppe

*ICARDA's mandate covers forage and pasture crops within the West Asia and North Africa (WANA) region—with emphasis on rangeland management and small ruminants; or, in plain language, ensuring that sheep and goats do not destroy the environment needed to sustain them. If they do, the environmental consequences will be tragic. Dr Gus Gintzburger explains why it won't wait—and asks if animals are the real culprits...*

## Animals on trial

**D**egradation of rangeland, and the resulting desertification and loss of feed resources, is a menace for the dry lands of the world. The threat is real enough, as I shall make clear below. But the cause usually given, overgrazing by small ruminants, is an oversimplification. And even if this were not the case, we would still not be justified in presenting the sheep and goats as public enemy number one. Whatever they are doing to the rangeland, they are doing it to feed us.

That does not mean that overgrazing is of no consequence. But any solutions we, as scientists, come up with must recognize the position of small ruminants in the farming system and the human food chain.

First of all, what are rangelands? They are the lands which are too rocky, too sloping, where the soil is too shallow or affected by salt and gypsum, and rainfall is too low for sustainable cropping under rainfed conditions. In fact, the prime and historical function of rangelands has been to support livestock production by nomadic pastoralists, and this function has extended from Morocco to Mongolia, through all central Asia, between the 400 and 150 mm rainfall

isohyets. In this part of the world, it is often referred to as the steppe, a huge territory of flat or gently undulating semi-desert covered with small woody shrubs (see box 1), now under threat by encroaching cultivation and overuse by pastoralists.

Here in the West Asia and North Africa region, agriculture may be profitable in areas with rainfall of 200-250 mm and over, where barley production predominates. Below about the 150-125 mm isohyets, we find the true rocky and sandy desert where only a little native vegetation will be found in the wadi beds. Rainfed cultivation is impossible in these conditions.

**S**omewhere in between lies the steppe, the domain of pastoralists. As we shall see, some of the rangelands and the steppe *can* support cereal production up to a point; but using it for this purpose is chancy because of low and unreliable rainfall, and has long-term environmental consequences. Recent estimates are that the steppe area is being reduced by 1% annually by a combination of desertification and improper cereal cropping. About 9 million sq. km. of the world's drylands have been



***Enter the desert...From grazing land to dust bowl in a generation? Things aren't always that bad. But unwise cereal cultivation and overgrazing in low-rainfall steppe areas have exposed the topsoil to the wind.***

rendered unproductive in the last 50 years. Ordinary farmland wrecked by unwise modern irrigation accounts for much of this, but rangeland is also significant.

It can no longer cope with the demands upon it; whereas 40 years ago, steppe in the WANA region provided about 60-80% of the small ruminants' diet, it can now barely meet 5-10% of the requirement.

There is a further threat—fuelwood gathering. Research in Iraq and North Africa in the late 1960s suggested that a nomad tent of 10 persons would consume 3.5-4 tonnes of dry wood a year. Set this against a contemporary above-ground biomass in the rangelands of 200-500 kg per hectare and we are faced not only with a shortage of fuel

***Milking time: small ruminants convert poor-quality feed into good-quality food. Dairy products are an important source of protein.***



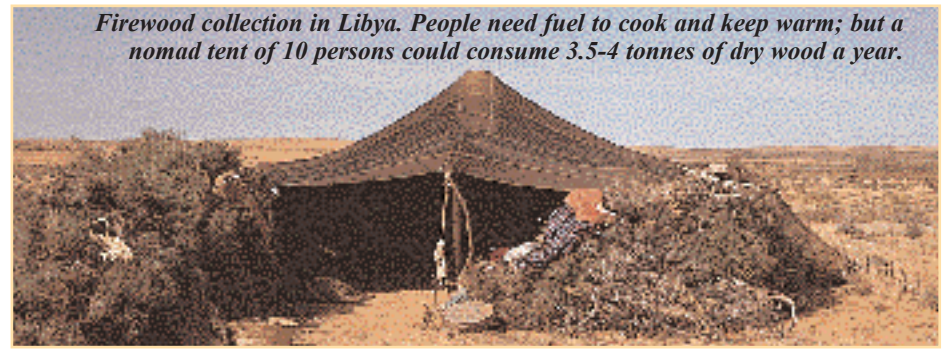


and feed, but something even more sinister on a long-term basis. The changes brought about in the vegetation cover and soil composition of the rangelands in this way may lead not only to a reduction in convective rainfall, causing local drought, but greater concentrations of carbon dioxide— with global climatic implications. At the moment, both of these are a matter of informed speculation, but there is justification for further research and strong action for rangeland protection.

But it is cereals encroachment and overgrazing that have caused the damage so far. Why? What has been going on?

Up to the 1940s, the farming system in the steppe was simple; groups of bedouin grazed their flocks, kept on the move, and (sometimes with good reason) kept out of each other's way. There was a balance; livestock numbers would be limited by available feed resources, and demand by the size of the population, then much smaller.

Then motorized transport arrived, and sheep and goats, hitherto shunned by some Bedouin as somewhat ignoble, began to replace camels. Political change led to pressure on nomadic herdsmen to settle down. And mechanized cultivation made it more profitable to raise barley on the steppe, despite the low rainfall. As a result of this latter factor, Bedouin went into financial partnership with farmers on the margin of the steppe (also because they were no longer allowed to extract protection money from them!). They would provide capital for seed and machinery and receive a handsome percentage of the crop. Before long, many



*Firewood collection in Libya. People need fuel to cook and keep warm; but a nomad tent of 10 persons could consume 3.5-4 tonnes of dry wood a year.*

Gus Gintzburger

began to carry out these operations on the steppe themselves. A normal process and progress in personal income and adaptation to the modern world!

Nomadic pastoralism did persist in the lower-rainfall parts of the steppe; it does now. But the flocks were no longer independent of the settled farming system, becoming increasingly dependent on crop residues and subsidized grain and feed. Indeed, as barley encroached on the steppe, the loss of traditional feed resources that resulted was more than made up by the availability of cereal straw or, where the crop had failed due to poor rainfall, the whole barley crop itself. In a good year, in some countries, that crop provided hitherto unavailable food for a growing urban population. So what was the problem?

**T**he problem was that, as we now understand, cereal cultivation on the desert margin is an environmental disaster. Below about 200mm annual rainfall, barley cropping provides a worthwhile crop about one year in four or five. Thus, and as an example, during 1988, a very wet year, farmers in Syria, Jordan and Iraq saw an excellent harvest; but in the following very dry years, many abandoned cereal cultivation in these areas in disgust. In fact, ris-

ing incomes in the cities mean that livestock products are more profitable than barley now, anyway. But native steppe vegetation did not regenerate after barley cultivation; the biodiversity that provides steppe vegetation had gone, and intense stubble grazing by sheep had left the topsoil unprotected, exposed to wind and water erosion. Even where the latter is not serious, it will still take the steppe at least 15-20 years to recover from cereal cultivation. So the option of using the land for livestock grazing was no longer open.

The move to cereals is not all bad. Crop residues, whether produced on or off the best rangeland, do provide a source of feed, and it could be argued that they can also relieve pressure on rangeland biomass. Most countries of the region, especially Jordan, Libya, and Saudi Arabia, show a strong trend for rangelands to be a diminishing percentage of the small-ruminant diet. The trouble is that— according to projections by ICARDA's own experts, based on a realistic assessment of probable crop production increases— crop residues, forage crops and feed-grain production will never be high enough to meet the need. Jordan, Algeria and other countries of the region already showed a deficit in 1990, and by 2020 it is likely to be very serious.

## Give seedlings a chance

"Revegetating degraded rangelands can be a costly exercise, so you cannot afford failures. You have to maximize your chance of a prompt establishment and further development of the young seedlings under a more favorable environment than the surrounding bare flats," says Dr Gus Gintzburger, leader of ICARDA's Pasture, Forage and Livestock Program (PFLP).

With this in mind, he developed a simple pitting machine while working in Western Australia a few years ago. The machine breaks the hard-crust and compacted soil surface which has usually formed on flat, overgrazed and degraded rangelands. It is, in effect, a low-cost/low-input micro-water harvesting machine. Now the machine has undergone further development work at ICARDA. It has been designed with a low-tech approach and can operate behind an ordinary car or pickup.

A continuous furrow would allow too

**Soil surface (right) crusted through inadequate vegetation and by compaction by livestock in Libya. (Below:) The answer? The ICARDA pitting machine can be towed behind any ordinary vehicle.**



Gus Gintzburger

much rainwater collection and runoff, and increase the erosion risk on the fragile pastoral soil. Instead, the pitting machine creates a series of separate pits or short furrows (100 cm long, 20 cm width and 10 cm deep). The shallow pits act as small water catchments, a trap for fine soil and organic

matter particles, and also for wind-transported seeds.

"There's no need to rip the soil down to 30-50 cm. We want a low-cost method, and would rather avoid using a tractor; it is not a rangeland cropping or bulldozing operation! It is better to create a string of small niches for starting the revegetation process with a few well-chosen species adapted to arid environments, for example, native annual legumes, or *Atriplex* sp. and *Salsola* sp. Experimental work is planned in the Syrian steppe. What we need is the seed of adapted species, and the support and patience of the local users."

There are other causes of rangeland degradation besides cereals encroachment; for example, the capacity to truck feed, often subsidized by government and relief agencies, and water into any rangelands and keep small ruminants *in situ* despite the shortage of grazing, for example—a process once described as “transforming rangelands into open-air feed lots.” This means that the vegetation does not have the chance to regenerate. In some areas, moreover, traditional controls over grazing have been broken down by political change, and not replaced. The steppe, it is alleged, is open for grazing to all! Indeed, many commentators have suggested that this is the key factor; but recent research has uncovered a more complicated picture.

While these disasters have been taking place, the human population of the region has shot up—a fourfold increase since 1945. Most people in WANA still can't afford to eat meat that often, but consumption is rising; and the dairy products are a significant source of protein for them. But the growth of cereals production away from the steppe has

reduced the availability of marginal land for grazing in the higher-rainfall areas, reducing flock sizes there. Yet overall sheep numbers have risen by about 75% since 1950. (In some areas, such as Balochistan, where livestock have been driven from war-torn Afghanistan, the increase has been much higher.) This meant that, as the rangeland area has shrunk, the number of sheep and goats trying to graze it has risen. Researchers think that the stocking rate on arid-zone rangelands has increased from one to four sheep and goats per hectare in the last 45 years, and the area of those rangelands has been reduced by 50% over roughly the same period.

Clearly, sheep and goats are not the sole villains of the piece. Their numbers have risen on the steppe because we still wanted the flocks, but also wanted the land for cereals. The trouble is that high stocking rates cause overgrazing and loss of biodiversity. Over huge tracts of steppe, both those that have been used for cropping and, increasingly, many that have not, there is not much left for grazing or to protect the soil with the exception of unpalatable shrubs that may move in when everything else

moves out. In many places, the once fertile soil is blown or flushed away, leaving a compacted and crusted top layer preventing rainfall infiltration, allowing germination of fewer and fewer seeds of native vegetation. Here comes the desert!

A few years ago, two colleagues commented acidly that “a vast majority of research workers prefer to do research about a problem rather than do research to solve a problem.” There is sometimes truth in this. But we cannot afford to take that sort of attitude to a problem as pressing as the range.

Moreover, some rangeland restoration is possible. These are some of the strategies ICARDA is pursuing.

\* Application of superphosphate looks hopeful, and may be profitable at rates as low as 25 kg/ha on the wettest marginal lands and rangeland providing that a seed stock is still present in the soil. But who is willing to pay for the fertilizer?

\* Small-seeded local pasture legumes could play a role, especially with micro water catchments. ICARDA has been working hard on this, selecting from its plant genetic resources the most suitable ecotypes, and developing low-cost, low-input machinery to help make it practicable for farmers and development agencies. Seeds can also be “sown” with the help of sheep and goats and a few carefully-placed piles of hay! (See Feed for the future in *Caravan* No.1—we hope to return to the subject in future issues.)

\* We are also working on saltbush and other fodder shrubs. There is a growing body of research in this by ICARDA, the Syrian Steppe Directorate, AZRI in Pakistan and others, and indeed we are now the coordinating center for an ecoregional initiative on using shrubs to combat desertification. ICARDA is also involved in collaborative shrub research in other arid zones countries. More on this on page 18.

\* There is a need to strengthen the participatory aspect of all rangelands research. Misfires have occurred through its absence—for example, attempts to combat degradation through shrubs have partially failed in the past because the project was imposed on farmers or pastoralists, who were not convinced of its value, or whose land was “confiscated” to establish shrubs plantations and reserves. This need drives integrated rangeland management projects like those organized with the Syrian Steppe Directorate at Maragha and with Central Research Institute for Field Crops, Ankara, in the Central Highland zone of Turkey. These are very different projects, but both have had encouraging results so far.

\* There is also a need to establish the rootcauses of overgrazing worldwide—and

## The white artemisia

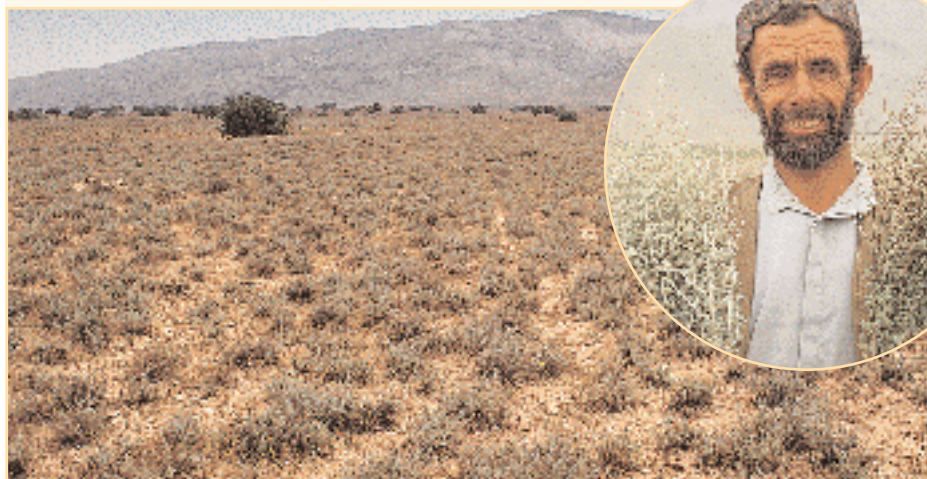
The white artemisia (*Artemisia herba-alba* Asso.) is a common shrub found in most of the steppe countries, from Central Spain to the high plateaux of North Africa, in the lowlands of Libya, in the Syrian and Iraqi rangelands, and in the endless steppe of the central Asian republics. It is a low (10-30 cm), woody shrub colonizing most of the loamy and clay flats of the semi-arid and arid mediterranean and temperate steppe.

It is of value in several ways; for exam-

(Below): A healthy stand of artemisia near Sinjar, Iraq. (Inset:) Farmer Hadji Khan of Kovak valley, Balochistan, with two types of white artemisia.

ple, as a feed reserve for autumn grazing (Algerian pastoralists claim that artemisia gives a special flavor to sheep meat). Its aromatic and scented leaves, which contain santonin, are used for medicinal purposes by the nomads and is often used by city dwellers as a cure for stomach pain and internal parasites. It is also often collected by nomads as firewood near camp sites.

This plant may be of interest in future large-scale rangeland restoration operation in the steppe. Its low, and seasonally restricted, acceptability to small ruminants helps prevent its complete destruction by overgrazing. Other fodder shrubs from the steppe, such as *Salsola vermiculata*, are also of interest because of their ability to self-reseed, but may prove too palatable to stand tough grazing. As so often, more research is needed.





the constraints to their removal. This means spending time with pastoralists and understanding their working lives. ICARDA is actively involved in this—see page 22.

\* Nothing can be done without firm information on the state of rangeland, and on its biodiversity. In Syria, Japanese scientists collaborating with us have covered a lot of ground—literally—with GIS; see *Degradation at a glance*, right. And we are planning the establishment of an ICARDA herbarium which will help us understand the rangeland ecosystem and biodiversity, and keep track of it in the future.

\* We can't ignore cereals as a complementary source of feed. Palatability of straw is now an integral part of barley breeding at ICARDA (see *A broad spectrum of barley*, in *Caravan* No.2). Rotation of cereals with forage legumes (see *Feed for the future*, *Caravan* No. 1) could help stabilize cereals yields and provide another feed source; along with this, integration of crops and livestock into the non-steppe farming system is important, and we are doing collaborative research on this in Algeria, Syria and Lebanon. Water-harvesting (see *The lost resource*, in *Caravan* No.2) can help stabilize cereal yields in some selected zones of the steppe.

\* It is essential to establish just what maximum safe stocking rates are in the steppe, and work out application of these by working with farmers and pastoralists—not just our computers...(see *A balance of forces*, page 20).

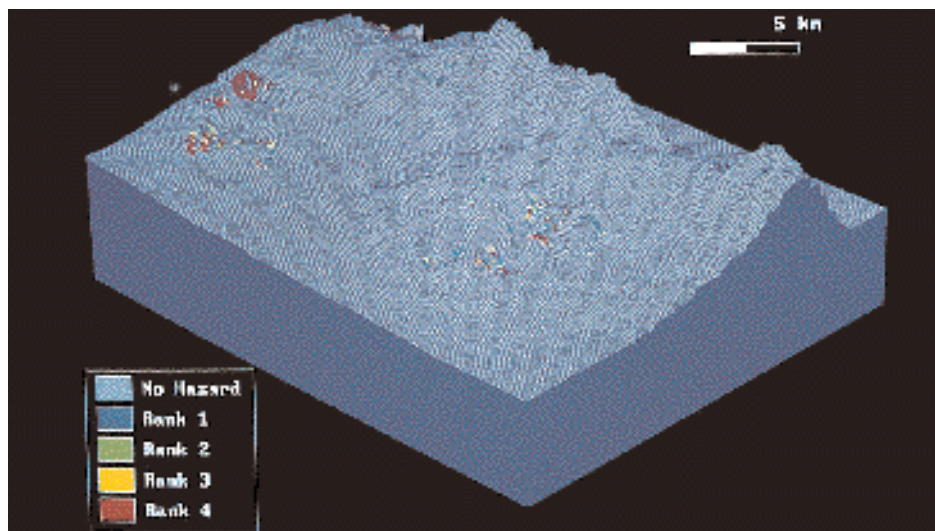
\* We are also making a strong move towards a better understanding of how the grazing territories and land rights are organized between groups of pastoralists. In fact, we are slowly rediscovering that the tribal rules and land ownership are still very strong in many places on the steppe. A key issue for the future of the rangelands of region!

There are many causes other than sheep and goats behind the degradation of arid-zone steppe. There are many consequences from it. We know some of both; we don't yet understand others. We can't continue ignoring this important resource, often neglected and given lower priorities by decision makers.

But people want to consume meat and dairy products. Rangeland degradation is taking place because people want to eat. In fact, we should long have learned that environmental problems can be dealt with only in the context of people's real lives and needs.

It is an old message by now, so why do I feel that I have to repeat it? ■

*Dr Gustave Gintzburger is Program Leader of ICARDA's Pasture, Forage and Livestock Program (PFLP).*



JIRCAS used geographical information systems (GIS) to spotlight areas at risk of degradation. ICARDA is now using similar tools to identify suitable sites for water harvesting (see *The lost resource*, in *Caravan* No. 2).

## Degradation at a glance!

*Can high technology be harnessed to the battle for the steppe?*

*Japanese scientists Dr Haruhiro Fujita and Ms Yukiyo*

*Yamamoto think so, and they've been proving it at ICARDA.*

A few years ago, farmers in the steppe were startled to see something resembling a barrage balloon floating 200 meters above them. In the balloon, a video camera and a still camera with a wide-angle lens were hard at work recording the state of the vegetation.

It was all part of a project to collect information on steppe degradation, digitalize it, and model both the state of the area and the potential "hot spots" for further degradation. The project is a collaboration between ICARDA and the Japan International Research Center for Agricultural Sciences (JIRCAS), whose scientists, in particular Dr Haruhiro Fujita, implemented the project. Ms Yukiyo Yamamoto of Japan's National Grassland Research Institute was also involved.

The Abdal Aziz mountain region in Northeast Syria is characterized by a barley-rangeland production system—a marginal area typical of those in the West Asia and North Africa region where overgrazing and unsustainable barley production combine to threaten the soil and vegetation of the steppe. To find out exactly what was happening to the area, the aerial photographs were put together with field-survey results to make maps of the geomorphological features—that is, the relationship between the physical features of the landscape and its vegetation. Other maps covered the vegetation itself, soils and degradation; information was added on seasonal grazing areas and wood-cutting.

These, plus a base map, were digitalized using a GIS (geographic information system) and geo-coded. The end result was a resources map which can display any or all of these factors to researchers in the area. The next step was to extract data from the map and run it through a Neural Network program, which can interpret this data to pinpoint areas at risk of degradation. Scientists then used a GPS, or Global Positioning System, to identify these areas on the ground and test the map's accuracy.

This was greater in some types of landscape than others, according to JIRCAS. In some areas, on moderate slopes, the hazard map's prediction of degradation could not easily be confirmed on the ground. JIRCAS has suggested that local climate and resource-use variables should be included in the modelling. However, in the hills in the northern part of the area and on the plain, it led the researchers to areas which did indeed turn out to be at risk.

Japan has long worked with ICARDA, and last year also stepped up its financial contribution to the Center's work (see *Caravan* No.2). For many years it has been collaborating extensively on small-ruminant research, including animal health, a contributory factor in rangeland management (healthier animals are more efficient converters of feed into food). Japanese scientists at ICARDA are continuing to work on better management of native pastures and rangelands for the benefit of pastoralists. ■

# The battle for the steppe Shrubs could help save the steppe

*The high heat and salinity tolerance of certain types of shrubs could be important for rangeland rehabilitation—and provide alternative fodder at hard times of the year. Now years of work on fodder shrubs is bearing fruit.*

**H**ussein, a shepherd, had good news for us. We met him in April 1995 on the newly-opened range reserve at Maragha, Northern Syria. He had a flock of 200 head.

"I'm very happy. If my sheep were out on the poor pasture, I'd have to provide about 300 kg of supplementary feed every day." He was paying the equivalent of about US \$200 to graze the sheep on the reserve for a month; not a small sum, but the supplementary feed would have cost around US \$1150.

The reserves are part of a joint rangeland management project mounted by the Steppe Directorate of Syria's Ministry of Agriculture and, since 1989, ICARDA and ACSAD (the Arab Center for Studies of the Arid Zones and Drylands). The area has been planted with four species of fodder shrubs—*Atriplex halimus*, *Salsola vermiculata*, *A. canescens* and *A. nummularia*, which can survive heat, lack of water and, where necessary, salinity that would make any other form of fodder impossible to grow in adequate amounts. In recent years, most work has been on the first two, which are native, rather than the exotic species. Besides being an alternative source of grazing, the shrubs on reserve land shelter native pasture species and help them reestablish themselves, as well as fighting soil erosion—a positive contribution to the rehabilitation of steppe and rangeland.

Ten other shepherds were also on the reserve that day, with a total of 18,000 sheep. For the month, those 18,000 head were not consuming the remaining biodiversity on the steppe, or scarce feed brought in from elsewhere. By the time the month was over, crop residues (or, in a bad year, unharvested cereal crops) had become available at the margin of the steppe. The reserves in Aleppo province totalled 5,800 ha in 1995.

**By Ahmed Osman**



*Sheep feeding on saltbush shrubs in Northern Syria. The shrubs have their limitations as feed, but are a good stop-gap in the lean season.*

In 1996, a further 2,000 ha were mature enough to be opened, and another reserve of 6,000 ha will soon be ready.

It is not a magic solution. For a start, the nutritive content of the shrubs is not as high as other types of fodder. And the water requirement of the sheep does rise. Moreover, developing the technology has taken years of hard work by the Steppe Directorate, ICARDA and ACSAD. But if Mr. Hussein is typical, the effort has been worthwhile.

In the Mediterranean Basin—which includes North Africa, the Near East, the Middle East and parts of Europe—a total area of 550 million hectares is thought to be

suitable for shrubs establishment. Why?

Of this area, 320 million are within the Mediterranean arid zone, with rainfall of 100–400 mm, and the rest is semi-arid (400–600 mm). Moisture availability ranks very high among factors limiting agriculture in this region. Also of great importance, however, are the soils. They are alkaline (pH 7.0 and 8.5); large areas possess lime crust, and in the most arid parts there is also a gypsic crust (this is the case at Maragha). Moreover, salinity, a constraint on over 130 million hectares worldwide, affects 80 million in the Mediterranean Basin.

It follows from this that halophytes—salt-tolerant species—are needed. *Atriplex* shrubs are halophytes. It is reported that 1500 species of halophytes exist worldwide, one-third of which are sufficiently salt tolerant to be grown with highly saline water, including sea water. Over 400 species of *Atriplex* exist in the world; about 50% of them are found in USA, Australia and the Mediterranean Basin. Criteria for selection for our purposes include ecological adaptation to climate and soil, and the planned management and use.

**M**ost species of *Atriplex* can survive arid conditions because of their deep root systems, which enable them to reach water tables as deep as 10 m. They also score on high water-use efficiency, with a dry matter (DM) yield of up to 4 mg DM/g water.

So *Atriplex* shrubs, or saltbushes, may grow on degraded land where not much else will. But are they good feed? They have a high salt content, but we believe that the sheep can adapt to this after a short grazing period. Energy value is adequate for their maintenance, but not for pregnancy and lactation. However, the idea is to feed sheep for short periods of the year when there is noth-





*A saltbush plantation in Yemen. The technology has something to offer on rangeland throughout the world's dry areas.*

ing else. In any case, saltbushes can maintain sheep for short periods without supplementary feeding (and the farmers renting at Maragha had stopped using it). The shrubs are not ideal feed, but they are the closest thing to it which will actually survive the conditions in the degraded steppe.

Establishment of saltbushes can be through planting-out of young plants raised first in nurseries, or through direct seeding. Despite the high cost, planting-out of shrubs is the most popular, since the chances of success in arid areas are high. The major advantage of direct seeding, on the other hand, is the low cost. Land preparation for direct seeding usually takes the form of contoured furrows, again with enough space between furrows to help water harvesting. There are constraints to direct seeding of saltbush. Still, the best performers, the native shrubs *A. halimus* and *S. vermiculata*, can be established from direct seeding—and, more importantly, they are self-reseeding. Although the total area of shrubs planted from seedlings (all Syrian government reserves) is estimated, to date, at 48,000 ha, against 14,000 ha established by direct seeding, the latter method is expected to gain ground; it is *much* cheaper. In a recent study involving two provinces (Hama and Aleppo), the cost of establishing a given number of shrub seedlings on one hectare was about US \$53, while direct seeding of the same numbers on the same area cost very roughly US \$5-8.

The Maragha reserve is not the first attempt of the Syrian authorities to introduce fodder shrubs into the steppe economy. However, attempts in the 1980s to encourage shrubs through shepherd cooperatives failed through insufficient management advice—and fears that the government would reclaim land with established fodder bushes. ICARDA became involved in the fodder-shrub project in 1989. Its role was to

work alongside the Syrian Government to develop technical know-how on saltbush plantation management.

The latest phase of the ICARDA-ACSAD-Steppe Directorate project is aimed at showing the benefits of shrubs over natural pasture for livestock feeding and will thus make more effort to “sell” the idea to farmers.

The project has also been designed for sustainability. In this early phase of reintroducing the idea of fodder shrubs to Bedouin families, access is being limited to two months a year: first in April/May and again in November/December. These two periods are critical times for livestock owners, as feed becomes scarce.

The role of these shrubs in providing summer feed has often been suggested; what must now be tested is “nuts-and-bolts” integration into the agricultural system. Moreover, any such development must be a genuine collaboration with farmers; failure

to do this has damaged saltbush projects before now.

Even so, ICARDA believes that serious attempts must be made to integrate saltbush in the agricultural systems of the arid and semi-arid region. Salt bushes could also play an important role in rehabilitation of rangelands of the Near East, Middle East and North Africa, where barley cultivation has encroached. Rows of saltbush can be established within barley fields (originally designated as rangelands, having less than 200 mm rainfall). The system could help stabilize soils and reverse the degradation process. It will also provide balanced pasture, since barley stubble or residues will provide a source of energy needed for efficient use of the protein-rich plantation.

To encourage this, ICARDA is leading a project called *Production and utilization of multi-purpose fodder shrubs in West Asia and North Africa*. It is part of a system-wide livestock initiative mounted by the CGIAR. The shrubs project began with a successful meeting in Aleppo in February during which a plan of action was drawn up. Participants came not only from other CGIAR centers but from national programs, including Burkina Faso, Mali, Niger and Senegal as well as those with which ICARDA has more frequent links, such as Morocco, Jordan and Tunisia. Spain is also participating.

Shrubs will not bring about miracle solutions to rangeland degradation, or desertification. But in the real world of agricultural research, there are no miracles; just steady progress. And in the battle for the steppe, shrubs are some of the best weapons we have to hand. ■

*Dr Ahmed Osman, ICARDA's pasture ecologist, is also coordinating the project “Production and utilization of multi-purpose fodder shrubs in West Asia and North Africa.”*



*Government plantation of atriplex and acacia in Morocco, late 1994.*



## The battle for the steppe

# A balance of forces

*The way farmers use rangeland (indeed, any land) is governed by a complex relationship of farm-gate prices, tenure arrangements and other factors. Before conservation and development measures are taken, this relationship must be understood. Now ICARDA and its partners are modeling it in four countries, and a methodology should emerge.*

Let us start with a typical development scenario. "Go plant forage legumes," we say to farmers, "rotate them with cereals, and your cereal yields will be higher and you'll start seeing net cash benefits in two years, and more after three as your soil improves."

"Go do your research," replies the farmer. "I've only got access to this piece of land for a year. Anyway, why would I wish to improve my landlord's soil? Or the yield, either, come to that. He gets half of it."

It is to avoid this sort of wasted effort that ICARDA's Pasture, Forage and Livestock Program and its partners (see box, below) have embarked on a project, covering Morocco, Tunisia, Jordan and Syria, to model all these relationships so that researchers can better understand them. The project focuses on farm and community management of rainfed crop, livestock and range. And it models multiple scenarios, according to different land tenure arrangements and policy changes, with an eye to "the three Es"—Efficiency, Equity and Environmental Sustainability.

The particular focus of the policy/property rights research is the type of village that has both farmland and village rangeland. Households share the village's common grazing area more or less equitably and with varying intensity and degradation to vegetation and soil resources.

In-depth surveys in selected communities of this type lead to mathematical model-

**By Tom Nordblom,  
Nabil Chaherli and  
Tidiane Ngaido**

ing of the whole-farm economics of each farm type found. Farm-level decisions on cropping and livestock feeding/grazing are modeled, revealing the response to policy changes and the way incentives affect economic efficiency.

The farmers' choice of cropping plan has effects over time on soil fertility. For example, continuous cereal cultivation reduces yields, while rotation with food or forage legumes can have steady or increasing yields. These choices affect both short- and long-term profitability. So trade-offs are considered in the context of whole-farm models; besides different cropping plans, these include options for livestock feeding and grazing, crop and feed sales or purchases, leasing options, hiring farm labor, or employment of family labor off-farm, given alternative policy and tenure conditions.

Simultaneous modeling of the different farm types in the community allows the researchers to "experiment" with factors that could affect the community pasture, including range rehabilitation investments under alternative tenure arrangements. Thus, the community model allows examination of the trade-offs between those three Es we mentioned earlier.

*The partners in the modeling project are PFLP, the International Food Policy Research Institute (IFPRI) and the national scientists. IFPRI, based in Washington DC, is a sister center of ICARDA and researches agriculture, economy and food requirements. It has an obvious role in this sort of work. The 36 national social scientists engaged in the project are supported by two*

*full-time post-doctoral Fellows, one for policy and the other for property rights research; the two have been jointly appointed by ICARDA and IFPRI.*

*The partnership is broader again than this. The work is an activity of the Mashreq/Maghreb (M&M) project, working out of ICARDA's regional office in Amman. It is itself funded by the International Fund for Agricultural*

*Development (IFAD) and the Arab Fund for Economic and Social Development (AFESD). M&M links two of ICARDA's major regional outreach programs, West Asia and North Africa, in on-farm studies of semi-arid rainfed agronomy, livestock, management and policy and property rights in Algeria, Iraq, Jordan, Lebanon, Libya, Morocco, Syria and Tunisia.*

Here are two examples of such trade-offs. First, there is the one which began this article; share-cropping arrangements, which are typically one-year leases and payments in kind (cereal grain), have their disadvantages. They limit cropping to continuous cereals and preclude the use of beneficial rotations with legume crops. The model shows what the effects would be of longer-term leases, with cash payments, instead.

The second example is tenure options that limit access to community rangeland. Here, we can test a variety of assumptions:

- \* A "free run", aimed at maximizing community income, gives the greatest share of the rangeland to the most efficient farmers;

- \* A "constrained run", which allocates access to the range in proportion to farm areas held by each farm type, results in lower income but greater equity;

- \* Allocation of access rights according to the number of farms is a move further in the same direction;

- \* Finally, allocation according to the number of people is the most equitable solution, but provides the lowest income.

Each of the above scenarios, and others, can be examined under a variety of policy conditions. The community models are carefully devised to incorporate their probable evolution, account for the risk element, and discount perspectives that are needed in evaluation.



*A typical village on the margin of the steppe, depicting the relationship between on- and off-steppe farming systems. "beehive" houses are a traditional design—cool in winter. (Inset): Sheep feeding on barley stubble. The range and livestock needs to be understood if the rangeland is to be managed sustainably.*

By including the effects of different cultivation and grazing practices on productivity over time, the environmental dimensions can be expressed in the model. This is done through EPIC—the Erosion, Productivity Impact Calculator. We can thus integrate experience from technical research on agronomy, range rehabilitation and livestock management—and quantify the effects of policy and tenure options in the selected communities in each of the four



countries. The modeling is done in a way that allows cross-country comparisons, providing illuminating new insights.

The early stages of this work engaged the inputs of national policymakers through "mini-workshops" held in Rabat, Tunis, Damascus and Amman. These policymakers are tapped for inputs from time to time, and will be asked to review the outcomes; they should feel genuinely involved in the results.

This project allows experiments on integrated simulation models that would be very hard to test on the ground. It makes possible quantitative evaluation of the multiple likely consequences of various options for policy and tenure change with respect to the interests of the communities and the state. But the study communities represent only small fractions of their respective countries. So it is aimed at preparing methods for quantitative policy and property research that can be used, on a wider scale, for analysis of the three Es at a time of rapid change.

This work adds value to the agronomy, range and livestock research of ICARDA and its national partners, by showing the importance of that research and its potential contribution to farm and community wealth and sustainability, and to meeting national goals and needs. And it can provide immediate feedback to national policymakers by



## *Livestock: the women are the experts*

*Rehabilitation cannot be done without the help of the steppe users. And that means women as well as men. Women are a key part of the system, as Andrea Pape-Christiansen has discovered.*

The rangeland is the home of around two-thirds of Syria's 14 million sheep, kept by Bedouin families who heavily depend on livestock production for income generation through the sale of lambs and milk products, as well as for home consumption.

It follows that whoever milks and feeds those sheep should be consulted about the way to plan rehabilitation and stocking rates within the context of the farming system. That means, to a great extent, women. Recently, the division of labor among family members of 74 Bedouin families was studied during selected periods of the yearly cycle, interviewing the women apart from the men; the women were thus able to share their knowledge and express their opinions more freely without men's interference.

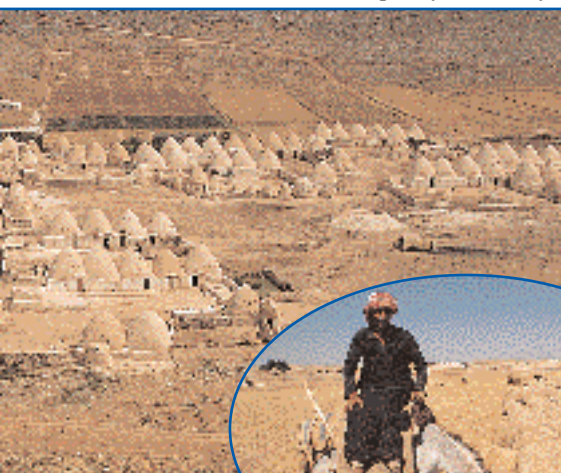
The periods of handfeeding of supplemental feed, milking, and moving from one place to another are the most labor-intensive periods in the yearly cycle of activities of Bedouin systems, and were thus the right time to analyse the female labor contribution.

During the average handfeeding period— five to seven months a year, mainly during the months of November to May— women and girls spend 2 to 6 hours per day on this activity. The time needed per day is influenced by the flock size, the number of household members that help with the feeding, the amount of grazing, the feeding management and the amount and mixture of fodder. The handfeeding frequency per day is two to four times; it is higher in farms with

smaller flock sizes, though the total time spent in this activity is relatively lower than with larger flocks. Rangeland degradation means that the frequency of handfeeding is rising— more work for women! They are not just carrying out this activity following orders given by the men; in two-thirds of the farms, women decide on the amount and composition of the fodder without consulting men.

Women are responsible for milking and milk processing; in more than 70% of farms girls help the women with these activities. On farms with large flocks, men or boys help the women by dividing the flock into smaller groups of about 20 sheep so the women can milk them more easily. The length of the milking season varies from three to four months (February to May). The time needed per day depends on the number of ewes milked, the amount of milk that is sold unprocessed, the number of women in the household and the lactation of ewes. The ewes are milked twice a day and the average milking and processing time per day is three to four hours. After milking, the milk is boiled and processed to yoghurt, cheese and ghee— a reminder of the importance of small-ruminant products as a protein source to those who cannot afford to eat meat, as well as those who can. If the women could decide, 60% of them would rather sell the milk unprocessed, because it would save them two-thirds of the total time needed.

During the months of June and November, most Bedouin families move



*dependent on the relationships. The distinctive summer, warm in winter, relationship between crops and is to stay productive.*

predicting consequences of the options they face in terms of the three Es, at both farm and community levels. ■

*Dr Tom Nordblom is an Agricultural Economist with ICARDA. Drs Nabil Chaherli and Tidiane Ngaido are Post-Doctoral Fellows specializing in policy and property rights; based at ICARDA, they are jointly sponsored by ICARDA and IFPRI.*

*Continued on page 23*



# *The battle for the steppe Continuity is the cousin of change*

*Attempts to protect or rehabilitate rangeland tend to begin with the assumption that traditional systems of grazing control have broken down. They have not. They are flexible, and adapt constantly. But they are real enough. Failure to understand this may sabotage any project from the beginning.*

Clan groups deriving their living in the exploitation of steppe resources have experienced great changes over the last 50 years. Their socioeconomic and political environment is now very different. But, because of these changes, researchers have sometimes failed to perceive the degree of continuity in their livelihood strategies and patterns of resource use. This failure can doom a rangeland management project to disaster right from the start.

In fact, contrary to the general assumption in some development circles, the grazing systems of these range-user groups have not buckled, leaving open access and free-for-all exploitation in their wake. Rather, they have adapted to the increasing human and livestock populations characteristic of

twentieth century life. This should be good news to any range scientist who advocates the involvement of local user groups, and their institutions, right from the beginning of any range-rehabilitation effort in order to ensure that it endures. This article tries to briefly outline the continuity and change apparent in Bedouin livelihood strategies and natural resource systems in the steppe areas of Syria. It draws on work currently in progress at ICARDA.

The breakdown in traditional practices— or, indeed, institutions— governing man's relationship with the environment is commonly cited as the primary mechanism of overstocking and degradation. But such institutions, and the related social organisations, are still very much in business. However, they have not always effectively checked degradation; and they sometimes defy analysis by an outsider (such as a researcher). So they have often been overlooked, and this neglect and the adoption of an 'open access assumption in its place has, in many cases, been the seed of failure in past range projects.

Even where such a project does not conflict with the local institutions it has ignored (and of course it might), such ignorance is still unfortunate. Traditional forms of grazing organization and regulation may not be perfect, but if they exist at all then it is far easier, and more efficient, to adopt and build upon them than it is to establish totally new ones; evidence for this abounds. Old institutions adapt past strategies and integrate new ones in much the same way as biological evolution works with the available assets and possibilities of the organism in order to ensure its survival. And, in both processes, there are moments of rapid change followed by fine tuning; they may ultimately succeed or become extinct.

Traditional institutions in the steppe are now in one of those moments of rapid change, mirroring the equally rapid changes in their environment and their relationship with it. External agencies and governments should first coordinate objectives with those of local groups and then to assist in the development of appropriate institutions and technologies which provide both flexibility and stability. Before they can do this, however, they need a good idea of what the local institutions are and how they

are changing. It is this that we are now exploring in Northern Syria.

The Hadidiyin is a large grouping of 47 clans, numbering no less than 10 000 households and herds, who, though not necessarily related, share a collective identity. It is within the context of this confederation that grazing systems can be understood.

In 1943, the French Mandate government divided the Hadidiyin into three distinct groups, or *factions*, based on the existing internal alliances; and roughly mapped their migration routes and grazing areas most familiar to them. The Bedouin term these routes and sites their *dira*. Fifty-three

**By Jonathan Rae and  
George Arab**

years later the current study found that these *diras* had not essentially changed.

Then, as now, sheep were the dominant livestock. They are the main focus for the individual household economies. However, they are not the only one; many family household strategies include seasonal agriculture and off-farm labor in addition to herding. We found that about 33% were involved in agriculture, 29% in off-farm labor and 15% in hired herding. Given variations in the geography of the study area, an individual or household could occupy any one of a myriad of positions between true nomadism and a sedentary lifestyle. (As far as can be established, a similar situation existed in 1943, although the specific jobs done may then have been different.)

Of the 47 clans of the Hadidiyin, 17— belonging to all three *factions*— are currently identified with particular grazing sites, totaling 3,290 sq. km. of steppe land. Recognition of this clan/land relationship by other clans within the Hadidiyin is usually based on one of three criteria. The most common is the securing of water in the area through digging, cleaning or claiming either a well or cistern (67%); the other common standards are through agreement or treaty (21%), or through historical use of the area (8%). Only 4% of these "land claims" were based on purchase.

Changes to this system of grazing areas have not ceased. They remain a key dynamic, if a rather veiled and protracted one, in steppe resource use. It is primarily through such changes that the impact of rising human and sheep populations is reflected.

Such "recognised areas," though, explain only part of the story of who uses steppe resources and the pattern this actually takes. To illuminate much of the rest, we must first understand the relationship between resource tenure systems and semi-



*George Arab gets the views of a Bedouin farmer.*



arid environments. Steppe areas undergo steep fluctuations in productivity in response to the very wide variations in rainfall over time and space. A strict property-rights system with impermeable boundaries would be unable to respond to such fluctuations. The alternative is a situation more opportunistic in nature—one which might well lead a casual observer (or, indeed, a researcher!) to conclude that the supposed traditional systems for resource use have given way to open access.

They haven't. Herd mobility is essential in such an environment, and that requires a resource system with non-exclusive tenure arrangements. The system is flexible, but it is definitely a system. This principle, in its many guises, is becoming increasingly recognised in Sub-Saharan Africa and it is readily discernible as a guiding factor among herding groups on the North Syrian Steppe, as it is on rangelands elsewhere in West Asia, and in North Africa.

Three types, or degrees, of tenure arrangements can be described among the Hadidiyin. The first is what may be termed a full common property system where users, grazing areas and stocking rate are known and regulated; a true common property system has other elements as well. The second can be called a limited common property system—where, again, users and area are known and regulated but the stocking rate is not of primary concern. The third is best described as open access; here, any type of self-imposed regulation is weak and ineffective.

As has already been inferred, the stocking rate is determined above all by forage availability. Above a certain threshold, a



***In their battle to halt and reverse steppe degradation, ICARDA and the national programs need allies. ICARDA recently hosted a visit from Faisal Nuri (above), the Head of Djub Ahmad Almsheel Sheep Breeding and Range Amelioration Co-operative in Syria. One of 14 such organizations on the Aleppo Steppe, it has a mandate for range management and drought relief as well as for providing essential animal fodder and loans to their members. Besides discussing cooperation in the field, Faisal Nuri was given a tour of ICARDA and is seen here at its sheep unit with the unit's manager, Adnan Termanini. Sheikh Agal (inset), of Wadi Faisal, Syria, is also cooperating with ICARDA researchers and recently showed them the document he is holding in the picture above. It's an affidavit from a sheikh of the Sba'a, members of the Aneze confederation, made in 1957 and reconfirming a split of grazing areas originally made in the French Mandate period. Such documents are of special interest as they demonstrate that steppe users do regulate grazing themselves.***

combination of two mechanisms for redistributing populations between areas seems to exist. (The threshold itself is a measure of a clans influence, and below it an open access situation is approached.)

The first mechanism follows the core-periphery population model; this means that grazing and water resources of a groups area is geared around supporting a core population in a bad year, while in a good year the area is able to absorb an additional peripheral, or floating, population. The second device is a system of reciprocal arrangements between groups.

The situation described above is a complicated one. But to ignore it when considering appropriate technology transfer or management schemes is to design for disaster.

The convenience of adopting an open-access assumption is attractive, as one is starting with a clean slate. But it is wholly misguided.

Any concerted approach to resolving the difficulties on the steppe must involve a close partnership between the government and the local people. The natural resources in question are so sparse, and produce so little, that direct government administration is likely to prove too costly. A long-term solution that works would have to involve user groups, making their own financial and institutional contributions to an integrated plan that covers the multiple uses and users of the steppe area—and ultimately addresses their need for improved food and livelihood security. ■

## ***The women are the experts*** *continued from page 21*

with their flocks to find grazing land. Naturally, the most important activity during this period is herding the sheep, and this is mainly the responsibility of boys. But, in a few households, women or girls are responsible for herding the sheep; these were households where male members went for off-farm work during this period. The survey found that about 47% of the sampled households drew some of their income in this way.

Even though women and girls are fully occupied during the handfeeding and milking seasons with these tasks and household work, they rarely get support from any of the male family members due to the traditional division of labor. According to studies done in other countries of the region, boys take on labor responsibilities much later than girls, because girls contribute to household labor at an early age. The influence of traditions can also be seen in the exclusion of women from the public mar-

ket, where men are responsible for buying all household items and for marketing of farm products; the restriction of women in traditional rural societies to the compound and the extended family. This is slowly changing in the resource-poor Bedouin farms, where women work off-farm as harvest laborers, or where the men are working off-farm and women have to go to the market themselves.

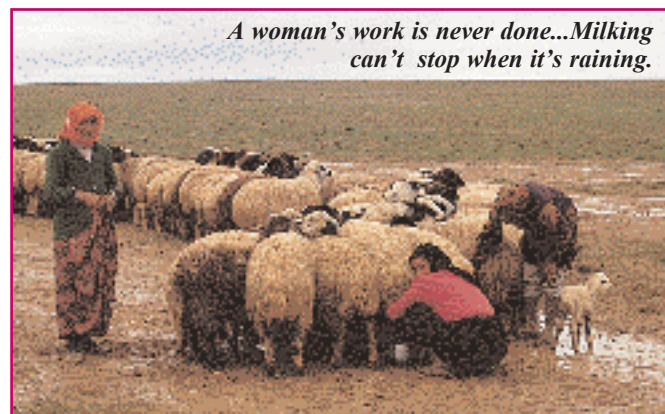
From the above, it is pretty clear that besides their role in providing food and child-rearing, women are also very active in the production side of Bedouin farming systems. Women's expertise and practices should be incorporated when research and extension personnel develop and introduce new technologies to improve the feeding management of flocks. The same applies to low-cost

technologies for milk processing.

If research and extension services can be more aware of gender-specific responsibilities in farm households, they can more effectively target their activities to address the decision-makers.

To achieve this, it will be necessary to work through female extension agents to ensure access to the women. But only by considering the indigenous knowledge of both Bedouin women and men will it be possible to plan for the future. ■

***A woman's work is never done...Milking can't stop when it's raining.***





# *If we can't feed animals...*



# *...they can't feed us.*



**P**ractices such as trucking of water to livestock on rangeland that has already been damaged (above) overgrazing and unwise cereals cultivation have badly damaged the world's feed resources. The picture at left tells the story. Agronomist Dr Adnan Sbata of Libya's Agricultural Research Center demonstrates soil erosion on arid, sandy soil. The plant's root system is supporting it above ground, showing that around 10cm has been lost from the soil surface in the 17 years prior to 1993, when this picture was shot. The implications are desertification and loss of feed resources, hitting at food supplies for urban and rural people alike. ICARDA and its partners are fighting back through an integrated strategy: understanding range-users' needs, rehabilitating damaged land with shrubs and forage legumes, taking steps to preserve rangeland biodiversity and modeling the way in which policy and tenancy arrangements affect land-use patterns. Only by working in all these areas can we hope to preserve valuable land for future generations.