



**On the road to recovery:** above, wheat plots at the Afghanistan Research Institute of Agriculture (ARIA) near Kabul in early spring; and left, a farmer and ARIA technician in a field of MH-97 at flowering time.



**Step by step:** Furrowing and hand seeding wheat at the Afghanistan Research Institute of Agriculture (ARIA) near Kabul.

# PLANTING THE SEEDS OF AFGHANISTAN'S REVIVAL

By **FIONA PERRY**

**E**fforts to get Afghan grain farmers back on their feet with improved, high-quality wheat and maize seed suitable for their conditions, have been given a significant boost with support from ACIAR.

ACIAR is managing a \$A1 million AusAid project in Afghanistan, implemented by CIMMYT – the International Maize and Wheat Improvement Center. CIMMYT has been providing locally adapted maize and wheat seed that can be sown straight away, while also working to improve seed quality. In the longer term, the project will focus on identifying stress tolerant wheat and maize varieties for Afghanistan.

The project has been christened Seeds of Strength and is being coordinated by Dr Mahmood Osmanzai, a Kabul-based scientist whose knowledge of local conditions and agronomic requirements has helped to deliver improved wheat and maize seed into the hands of Afghan farmers. This is done in the most cost-effective way with the help of various NGOs, UN organisations and other International Agricultural Research Centres, and in spite of the many travel restrictions in place.

The work is crucial to Afghanistan's recovery as years of drought, and decades of civil and military conflict, have left much of the country

in ruins. Up to 80 per cent of the 25 million population live below the one-dollar a day extreme poverty line.

Two decades of war have had a severe impact on the country's basic infrastructure and agricultural production systems, to the point where food production has dropped to less than half of total capacity.

As well, looting of the National Seed Bank at the end of 2001 led to the loss of Afghanistan's seed reserves, which normally ensure the availability of reserve stocks if the cropping cycle is interrupted or fails completely. All this has spelled disaster for a nation whose economy is almost entirely reliant on agriculture.

The humanitarian consequences have been enormous: widespread famine, a collapse of purchasing power, distress sales of livestock, large-scale depletion of personal assets, soaring food grain prices, rapidly increasing numbers of destitute people, and swelling ranks of refugees and the internally displaced.

The immediate goal, therefore, is to help farmers produce enough food to cover the country's basic needs and for the national agricultural system – both human resources and physical infrastructure – to be restored step by step until it becomes self-sustaining.

Having collaborated with Afghan



► researchers for more than 20 years, CIMMYT was able to respond quickly to Afghanistan's needs for seed of locally adapted wheat and maize varieties already tested and adapted to national conditions.

In 2002, 300 tonnes of certified seed of the CIMMYT-derived wheat variety MH-97, tolerant to local problems such as drought, cold, insects and wheat diseases, were imported from Pakistan. Along with urea and phosphate (DAP) fertilisers, it was distributed to 9000 farmers in four provinces in time for the 2002 autumn planting. The distribution was assisted by a number of NGOs such as the Agency for Technical Cooperation and Development (ACTED) and the Aga Khan Development Network (AKDN).

Last summer, seven improved varieties of maize, along with urea and DAP, were distributed to 500 farmers in seven provinces with the help of a number of national and international NGOs such as the Norwegian Project Office (NPO/RRAA), Kunduz Rehabilitation Agency (KRA), Coordination of Humanitarian Assistance (CHA), Improved Seed Enterprises (ISE), AKDN and ACTED.

As a condition of receiving the seed, farmers were asked to give a portion of the grain they produced to neighbouring farmers who did not have access to the seed in the first year of distribution. As well, five tonnes of a winter wheat seed called SOLH 02 (Peace 02) were distributed for autumn planting. The seed was imported from a CIMMYT Winter Wheat Observation Nursery in Turkey, and tested by the FAO in Afghanistan.

Local farmers have been trained to multiply seed through extension resources such as field days and visits, training seminars, demonstration plots and flash card presentations.

Dr Osmanzai has been encouraging farmers to use technologies such as treated seed, timely planting, an appropriate seeding rate, nutrient and water management and integrated weed and pest management, with little or no use of pesticides. He says that although

distributing MH-97 and SOLH 02 was a good start towards the resumption of wheat cropping in Afghanistan, farmers will need a range of varieties that are appropriate to varying conditions in the different wheat-producing areas of the country.

To this end, CIMMYT-Mexico used wheat from 35 international nurseries to establish trials and nurseries in Afghanistan for testing throughout the country in 2002-03.

"The nurseries planted at the main experiment station in Kabul, the Darul Aman Research Station, and five other regional stations have emerged and are doing well," Dr Osmanzai says. Local farmers have reacted positively to the new technology and "are pleased to have access to new varieties with better yields and other advantages, compared to their old varieties".

Farmers using the new technology have reported yields of up to two to three times higher than their neighbours.

"The lesson here is that through developing and adapting appropriate technologies, production and productivity of a wheat-based system can be significantly increased," Dr Osmanzai says.

He predicts that if planted and managed correctly, MH-97, SOLH 02 and other new high-yielding varieties (HYV) "should substantially boost wheat production in Afghanistan next year. This is an important first step towards helping Afghan farmers satisfy local wheat demands and reduce the country's dependence on foreign food aid and imports." ■

#### PROJECT:

SMCN/2002/028 Stress tolerant wheat and maize for Afghanistan: Seeds of Strength

#### Contacts:

ACIAR, Dr Tony Fischer, Adviser, South Asia, +61 02 6217 0533, [fischer@aciarc.gov.au](mailto:fischer@aciarc.gov.au)  
Project leader, Dr Sanjaya Rajaram, CIMMYT, Mexico, +52 55 5804 2004, [s.rajaram@cgiar.org](mailto:s.rajaram@cgiar.org)



**Suited to local conditions:** a bag of seed of improved wheat variety MH-97 imported by the ACIAR project from Pakistan.

## SEEDS OF STRENGTH

**T**he Seeds of Strength project is the first ACIAR project operating in Afghanistan, with a second proposed project in the pipeline.

Funded by AusAID, administered by ACIAR and implemented by CIMMYT, Seeds of Strength is delivering short to medium term support for wheat and maize production in Afghanistan through the immediate importation of certified seed varieties best-suited to conditions in Afghanistan, particularly for bread wheat varieties from neighbouring countries such as Iran.

On-farm participatory testing of the imported seed is identifying the best cultivars, allowing for their local multiplication and distribution. Particular attention has been paid to yellow rust resistance in wheat and to promoting improved agronomy along with improved cultivars.

To date, imported wheat varieties have yielded up to five tonnes per hectare and better – almost double the yield of locally favoured varieties. In 2003, 2.5 tonnes of seven open pollinated maize-seed varieties suitable for Afghan conditions were imported, and varieties yielding up to six tonnes per hectare identified.

The project has alleviated the 2002 seed shortage, and a favourable 2003 harvest is expected to boost seed stocks.

Afghan Ministry of Agriculture and Animal Husbandry (MAAH) researchers and agronomists have been trained by CIMMYT at both in-country courses and in Turkey and Mexico. International donors, including FAO and Japanese, French, Italian and Iranian groups have substantially rebuilt MAAH infrastructure.

CIMMYT and ACIAR are now developing a project proposal that aims to increase wheat and maize production. By testing imported germplasm in local conditions, promising new wheat and maize lines suited to local conditions will be identified.

Other initiatives will include releasing new varieties tested in local conditions, producing and disseminating seed, developing better management practices for wheat and maize, promoting better varieties and practices and building human resource capacity. ■



## LESSONS ON LENTILS FROM THE MALLEE TO NEPAL

AUSTRALIAN AND NEPALESE FARMERS HAVE COME TOGETHER TO IMPROVE THE QUALITY AND YIELD OF LENTIL AND LATHYRUS VARIETIES IN BOTH COUNTRIES. **FIONA PERRY** REPORTS.

**T**he monsoon-soaked foothills of Nepal are a long way from the dry fields of the Mallee-Wimmera in Victoria, Australia, but farmers from both regions are collaborating in an ACIAR project to improve the quality and yield of lentil and lathyrus (grass pea) crops in their countries.

Despite differences in climate and farming conditions and the relatively recent introduction of these crops into the Australian farming scene, the problems that Australian and Nepalese farmers have encountered are similar: a lack of resistance to fungal wilt disease, waterlogging and drought.

In 2001, ACIAR commissioned the University of Western Australia's Centre for Legumes in Mediterranean Agriculture (CLIMA) to set up study sites in both Nepal and Australia. The aim was to select and breed improved lentil and lathyrus varieties for cultivation in both countries.

Study sites were set up at Khumaltar, Nepalgunj and Rampur in Nepal, as well as at Merredin and Carnarvon in Western Australia.

After two years, there was an improvement in the resistance levels of Nepali and Australian cultivars to wilt-root disease such as *Fusarium*. Useful resistance was defined in nine out of 110 selections screened in 2002 and 2003.

The fungal disease *Stemphyllium* emerged as a major threat, but cultivars crossbred with

resistant varieties showed yield increases of up to 33 per cent. *Stemphyllium* is now being assessed in conjunction with root rot screening trials. The combination of beneficial rhizobial bacteria with best-adapted genotypes will most likely lift lentil production.

Compared to lathyrus, all the lentil cultivars under evaluation performed poorly when subjected to waterlogging, or excess soil moisture, in the flowering period at Nepalgunj.

In genotype and environment interaction studies in Australia, the disease *Ascochyta* affected many sub-continent genotypes. Conversely, Australian selections performed poorly in Nepal as well as being highly susceptible to *Stemphyllium*.

Lathyrus produces toxins which at their current levels are potentially harmful for livestock and humans. Low toxin lines of lathyrus grew well in a restricted sowing in Nepal, and will be trialled in larger plots. The Nepal project also showed the importance of involving farmers in field trials and seed increase, as it gave growers immediate access to improved varieties and technologies.

One of the project's Australian partners is the Birchip Cropping Group (BCG), a farmer-driven agricultural organisation established in 1993. The BCG conducts agronomic research on cereal, pulse and oilseed crops in the Mallee-Wimmera. ►

**Common problems:** John Ferrier, Australian farmer and treasurer of the Birchip Cropping Group, with Mata Parsad Barma, farmer and village development committee chairman, with farmers and researchers in a lentil field at Betahani near Nepalgunj.

▶ Third-generation Mallee-Wimmera farmer John Ferrier, who is treasurer of the group, says BCG's involvement grew out of "a long standing association with CLIMA and a commitment to research and innovation that will benefit farming communities in Australia and Nepal".

Last year Mr Ferrier attended a conference in Nepal on lentil improvement and inspected study sites and farms. He says the trip highlighted the mutual benefits of international collaborative research through development of networks and skills. He has since hosted a visit to Birchip by members of the Nepal Agricultural Council.

Mr Ferrier says there were already lessons for Australian lentil farmers from the studies. Seed priming – soaking seed overnight in water with manures or nutrients to promote germination, rapid root growth and improved plant establishment – was found to lift yields by up to 44 per cent, and is now a recommended practice. The study also showed that primed seed needs to be sown into moist soils.

"In Nepal, up to five crops may be sown in each field annually and the crop mixes of lentils with mustard, linseed or wheat look very promising," says Mr Ferrier. "Lentils were sown at 30 kilograms per hectare and brown mustard at 2kg/ha. Mustard matured early and was less competitive with the lentils. Vetch, a legume crop, could also be profitably used in Australia to 'green manure' our agricultural system to increase nitrate levels in soils."

Mr Ferrier says the project was an important collaboration and mutually beneficial for all involved, including CLIMA, the International Centre for Agricultural Research in the Dry Areas (ICARDA) and Australian and Nepalese scientific and farmer organisations. ■

#### PROJECT:

CIM/1999/064 Lentil and Lathyrus in the cropping systems of Nepal: improving crop establishment and yield of relay and post-rice-sown pulses in the terai and mid-hills

#### Contacts:

ACIAR, Dr Colin Pigggin, Research Program Manager, Crop Improvement and Management, +61 02 6217 0527, [pigggin@aciarc.gov.au](mailto:pigggin@aciarc.gov.au)

Project leader, Dr Clive Francis, Centre for Legumes in Mediterranean Agriculture, +61 08 93801878, [cfrancis@cyllene.uwa.edu.au](mailto:cfrancis@cyllene.uwa.edu.au)



**Meeting the challenge:** Dr Trevor Garnett of SARDI and Professor Yajun Chen.

## WORKING WITH CHINA TO FIND A DROUGHT-TOLERANT LUCERNE

**A** locally-adapted, deep-rooted perennial plant suitable for livestock grazing is on the wish-list of many farmers in many countries, but it takes on a degree of urgency in a populous country like China where food production and economic development are closely entwined.

One of the key limiting factors to increased animal production across much of China is forage production, largely because most of the best land is devoted to cropping.

Grazing country tends to be in marginal areas affected by drought, over-grazing, salinity and acidity.

As in Australia, which has similar production constraints, lucerne is regarded as the best option, and ACIAR-supported work to identify and multiply suitable lines is now well advanced.

Professor Yajun Chen, from Northeast Agriculture University at Harbin in Heilongjiang province (northern China), has spent six months working with fellow scientists from the South Australian Research and Development Institute (SARDI) on finding a suitable drought-tolerant lucerne.

The drought-tolerant lucerne project complements the broader ACIAR lucerne project. The project has seen more than 200 germplasm lines from a wide variety of sources tested for various traits. Of these, 70 lines are now being multiplied in Australia and 53 at two sites in China.

SARDI is the project's lead agency.

Professor Chen's visit and work at SARDI was funded under a Chinese government scholarship, and it reflects the high level of interest in China in the potential for lucerne to improve livestock and environmental circumstances.

Heilongjiang scientists are not direct partners in the project, but they are dealing with the same issues as ACIAR's formal project partners in Inner Mongolia, Gansu, Beijing and Shandong.

At SARDI, Professor Chen worked with Geoff Auricht and Trevor Garnett from the pastures group, analysing the characteristics that made Australian lucerne cultivars more drought tolerant.

SARDI's sophisticated glasshouses were used to put different lines under controlled levels of drought stress to help Professor Chen identify similar characteristics in Chinese cultivars.

Professor Chen's visit followed an earlier visit by seven researchers from China (and one each from Bhutan and Laos) to Adelaide for a short course in lucerne breeding. The course involved two weeks of lectures, practical demonstrations and field visits. The group also travelled to Western Australia for presentations and field visits in lucerne production areas.

Part of the research has included a soils study. Samples taken from all field sites in China were characterised for physical and chemical properties. Sub-samples of this soil were sent for rhizobial characterisation in Adelaide.

At almost all sites, soils containing rhizobia were effective on Chinese and Australian lucernes. This is a good result as it implies that extensive inoculation is not required when planting lucerne in the project areas in China. Further characterisation, of both rhizobial performance and diversity, is being carried out in 2004.

Because of the similar production constraints facing both countries, the work is expected to also make a valuable contribution to the ongoing development of improved stress-tolerant lines for Australia; in particular the cereals zone.

The expectation is for the project to develop improved lucernes for challenging environments in China and Australia. ■

– BRAD COLLIS

#### PROJECT:

AS1/1998/026 Lucerne adapted to adverse environments in China and Australia

#### Contacts:

ACIAR, Dr John Copland, Research Program Manager, Animal Sciences 1, +61 02 6217 0544, [copland@aciarc.gov.au](mailto:copland@aciarc.gov.au)

Project leader, Dr Geoff Auricht, SARDI, +61 08 8303 9498, [auricht.geoff@saugov.gov.au](mailto:auricht.geoff@saugov.gov.au)