Australian Government
Australian Centre for
International Agricultural Research

A **helping hand** in **East Timor**

PARTNERS
IN RESEARCH FOR DEVELOPMENT

JUNE 2004

INSIDE

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A NEW LOOK FOR *PARTNERS* MAGAZINE

Welcome to a new-look *Partners in Research for Development* magazine, a combination of the best of the old-style *Partners* and our Corporate Newsletter.

As always, *Partners* will report on ACIAR activities, with an increased focus on the people who help us achieve our goals and those who benefit from better policies, increased productivity and more sustainable agriculture.

Agricultural research for development has a critical role to play in helping feed the nearly 800 million chronically undernourished people worldwide.

In our own Asia-Pacific region, the focus of the majority of ACIAR's activities, 1.8 billion people live in rural areas. For many of these people even a small improvement in agricultural productivity can translate to large improvements in their livelihood.

This is the challenge for ACIAR and our partners, to deliver agricultural research that makes a difference.

Partners reports on just a small number of our projects that are meeting these challenges throughout the region, such as a partnership with World Vision to deliver research benefits to farmers in several countries.

Each edition will also spotlight activities in a country or region, and present stories grouped thematically around specific agricultural issues. This edition highlights our program in Vietnam, and work under the themes of improving cropping productivity, including in East Timor and Afghanistan, and agricultural simulation modelling, where ACIAR-supported research has delivered benefits overseas and to Australia.

Peter Core
Director, ACIAR

PARTNERS
IN RESEARCH FOR DEVELOPMENT

Partners in Research for Development presents articles that summarise results from ACIAR-sponsored research projects, and puts ACIAR research initiatitives into perspective. Technical enquiries will be passed on to the appropriate researchers for reply. Reprinting of articles, either whole or in part, is welcomed provided that the source is acknowledged.
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Executive Editor: **Warren Page**, ACIAR,
+61 02 6217 0500
Managing Editor: **Brad Collis**, Coretext Pty Ltd,
+61 03 9318 9362
Design and Production: Coretext Pty Ltd
www.coretext.com.au
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Letters from readers are welcome, and should be addressed to:
The Editor,
Partners in Research for Development,
ACIAR,
GPO Box 1571,
Canberra, ACT 2601,
Australia.
email *comms@aciar.gov.au*

Cover Photo: East Timor turns its face to the future. Photo: **Brad Collis**

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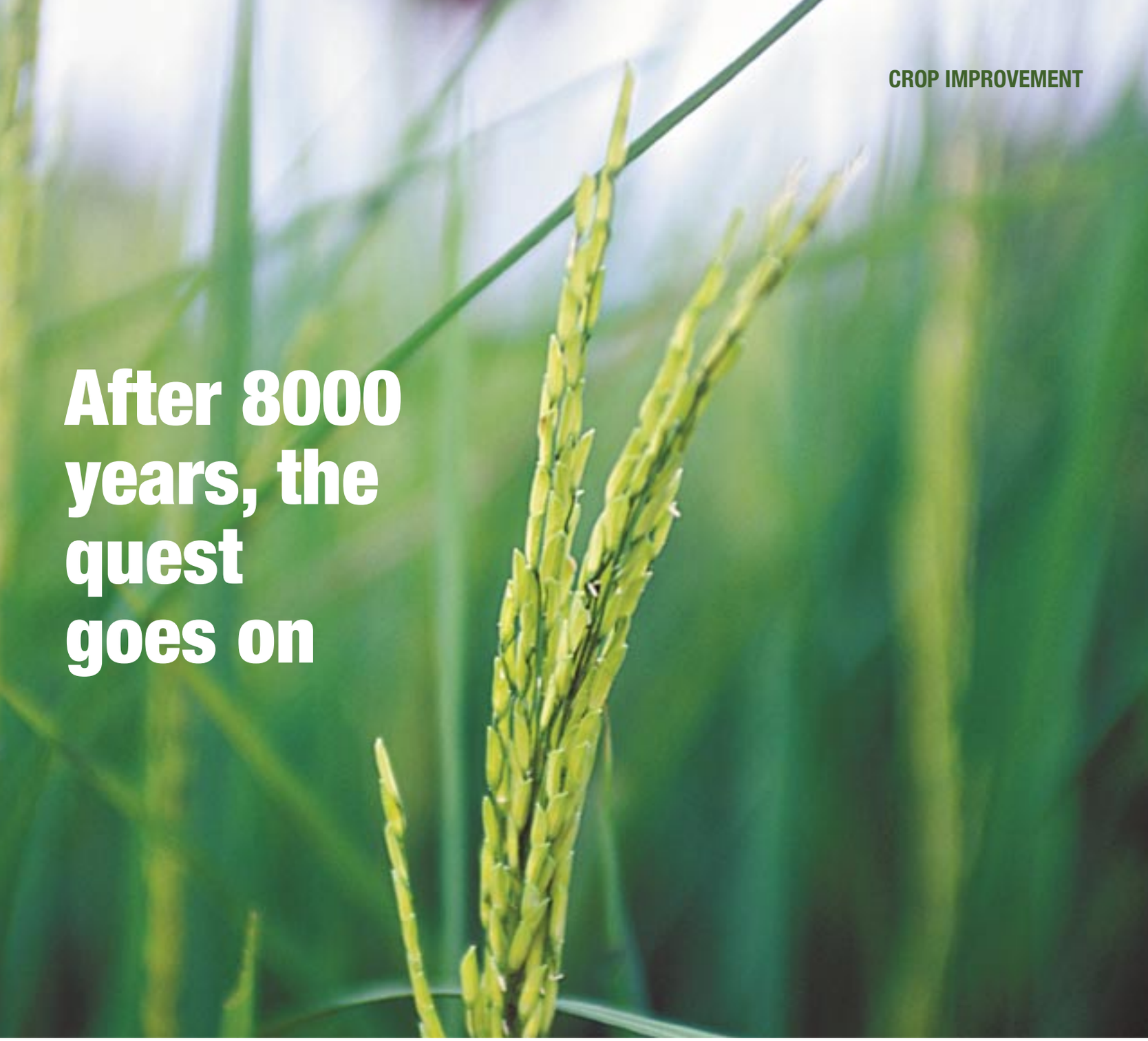


After 8000 years, the quest goes on

PROJECTS AIM TO IMPROVE CROPS IN PARTNER COUNTRIES

Despite the notion of crop improvement being a recent scientific advancement, the methods used have changed little since the first wheat crops were developed around 8000 years ago.

Most research into crop improvement still involves practices that were developed, whether through accident or design, by ancient farmers, essentially adapting crops to better suit local environments.

Developing countries plant a range of crops also grown in Australia, the difference being that in many developing countries the crops are not well adapted to local conditions. Crops grown in Australia are not native species, but the varieties chosen and grown have been adapted to the growing conditions on Australian farms through many years of research.

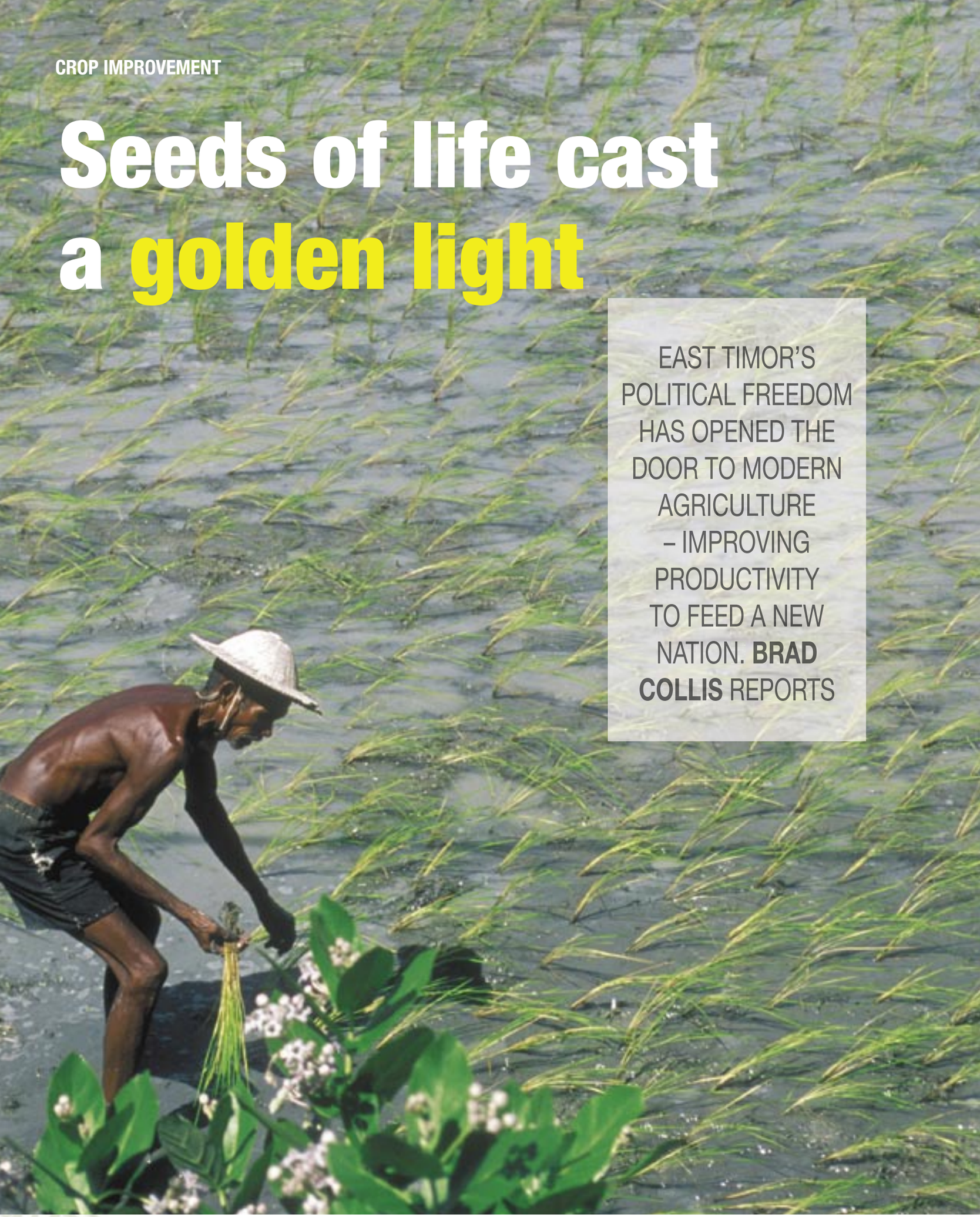
The same process is only beginning to gather genuine momentum in a number of developing countries, and is being supported by ACIAR research. Many food crops are grown outside their centres of origin, yielding at lower levels than would varieties more suited to local conditions.

Using the crop improvement research expertise of Australian scientists, ACIAR has undertaken, and continues to undertake, a range of projects to improve crops grown in partner countries – through more suitable varieties and by adapting those and other varieties to better suit local growing conditions.

On pages 4-11, *Partners* looks at some of these ACIAR projects.

Seeds of life cast a golden light

EAST TIMOR'S POLITICAL FREEDOM HAS OPENED THE DOOR TO MODERN AGRICULTURE – IMPROVING PRODUCTIVITY TO FEED A NEW NATION. **BRAD COLLIS** REPORTS



The village women sit cross-legged, patiently shucking corn; production-line workers filling woven baskets with tumbling grain. Ordinarily there would be nothing to differentiate this moment from countless others in the cycle of life and work in the foothills outside Baucau, on East Timor's central north coast.

The crop has been harvested, the women, young and old, are doing what they have always done – yet the whole scene depicts a farming revolution. The grain, being prised off the cobs by a blur of callused thumbs, is yellow. Plus there is a lot more of it.

This new, high-yielding yellow maize is one of the more visible changes to an agricultural system that has effectively been unchanged in East Timor's rural areas for hundreds of years.

The freedom won from Indonesia in 1999 has opened the door to modern agriculture – something that is going to be crucial for food security and for the country's long-term aspiration to find an export crop.

The new yellow maize is being grown on a farm run by an Italian priest, Father Locatelli, who was a prominent figure during the two decades of resistance against Indonesian occupation. The farm, at Fatumaca, near Baucau, is attached to an agricultural high school run by the Silesian missionary order. It has proved the ideal site for crop trials being undertaken by a former CSIRO agriculturalist, Dr Brian Palmer. Already his yellow maize, provided by the International Maize and Wheat Improvement Centre (CIMMYT) in Mexico, is yielding up to six tonnes a hectare of 'corn' compared with the indigenous white maize's average of 1.5 tonnes.

If these high yields can be replicated across the country for staple crops like maize, it will free up land for more commercial ventures such as vanilla, soybean, peanuts and candle nut (for oil) and agroforestry.

While farmers are not suddenly clamouring for the new yellow variety, the fact that those around Fatumaca have been willing to give it a try, indicates some receptiveness to innovation.

Palmer, who has been volunteer project leader for the $1.2 million ACIAR 'Seeds of Life – East Timor' project, argues that change will only succeed if it is adopted willingly: "Our new high-yielding maize is yellow. The traditional variety here is white. It's not up to me to tell them to change. What is up to me is to demonstrate the performance of the new crop and then leave the decision to them."

Palmer is sensitive to the dangers of introducing unsuitable agriculture: "This is a small country. It would be easy for something inappropriate to pass around quickly," he says. "I would not like to be the person responsible for introducing a new crop variety or method that failed in the long-term because it wasn't properly tested."

Laying the foundations: Dr Brian Palmer and a Fatumaca farmer inspect a crop of ground nuts.
Opposite page: An East Timorese farmer plants rice, hoping he'll get a harvest. Early relief efforts without the backing of agricultural research resulted in many farmers receiving unsuitable rice varieties to grow.

The Seeds of Life project, overseen by ACIAR research program manager Dr Colin Piggin, has changed from a humanitarian operation in 2000 to an agricultural extension program with the development of commercial crops as the ultimate goal. Its genesis was in the aftermath of the violent reprisals after the East Timorese voted for Independence in September 1999. Seed for the next harvest was either burned or stolen. ACIAR contacted the world's five leading crop research centres for suitable supplies and by December 2000 the first test crops were being sown.

The International Centre for Tropical Agriculture in Columbia (CIAT) provided soybean, mungbean, cowpea and cassava seed. Contributions also came from the International Potato Center (CIP) in Peru, the International Rice Research Institute (IRRI) in the Philippines, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India, and CIMMYT in Mexico.

Brian Palmer was in the first wave of helpers to go to East Timor and has been there ever since: "I had spent 20 years as a research scientist. Now was a chance to put it to real use," he ▶

Making change happen: East Timorese women shucking corn, above, and right, a trader in a Dili produce market.

PROJECT:
CIM/2000/160 Seeds of Life – East Timor
Contact:
ACIAR, Dr Colin Piggin, Research Program Manager, Crop Improvement and Management, *piggin@aciar.gov.au;*

Footnote:
The Seeds of Life project was scheduled to run until 30 June 2004. A second phase is now being developed by the Mininstry of Agriculture, Forestry and Fisheries, East Timor, in collaboration with current partners IRRI, CIMMYT, ICRISAT, CIP, CIAT, and Catholic Relief Services and potential new partners, the National University of East Timor and the crop extension group of the Northern Territory Department of Business, Industry and Rural Development. ACIAR and AusAID are discussing ways to link and jointly support promotion of better crop varieties identified in the Seeds of Life project.

explains, trudging through sucking mud after the opening rains at Fatumaca.

Palmer is hoping his string of crop experiments around the country will become the basis for new, improved farming systems. He has been using the germplasm provided by the research centres to improve the crop selections for East Timor's four main 'agro-ecological' zones.

"Once we feel we have lines that are well adapted to East Timor we then have to determine if they are acceptable to the farmers, as with the white corn/yellow corn example. Farmers are going to have to weigh up taste preference versus the food security that comes from the high-yielding yellow corn."

Palmer is confident the higher yields will win-out and points out that in other crops, such as sweet potato, villagers already prefer the flavour and size of the new varieties.

Elsa Ximenes, a farmer from the Aileu district, says: "We are very happy with these new crops. They are much bigger than the old sweet potato. I can already tell they will sell well in the market".

Brian Palmer says the key to farmers adopting new varieties and methods is what he calls 'participatory planning'. "To me this means offering them technically sound options from which they can choose," he says. "Some aid organisations simply want me to give farmers what they ask for. Well, until they've been exposed to a range of viable alternatives, that's not giving them the options to move forward. And if the farmers who are recognised in an area as good farmers become involved, and adopt the new varieties and new technologies, then others will follow."

Contrary to the pessimism that some observers have expressed about East Timor's economic progress, Palmer is confident: "The progress we have already made and the willingness of the international agricultural

science community to be involved makes me pretty optimistic."

Palmer says he wants to lay down a foundation on which East Timor's own young graduates can build – an ambition that has come a step closer with the restoration, also supported by ACIAR, of the University of East Timor's agriculture faculty.

There are four second-hand computers for 1200 students, squeezed into six lecture rooms: "We're still in the chalk and talk days," says dean Flavian Soares. "But given that everything was destroyed, we're actually making good progress."

The university's curriculum has an emphasis on practical skills and graduates are expected to return home to help develop their communities. Most of the faculty's senior students are in their mid-to-late twenties, their education broken by the destruction of the university after the independence vote. As teenagers many had belonged to the Falintil's clandestine courier network.

By the age of 15, aspiring agronomist Sipriano Martins had acquired the code name Saruntu, 'fight like a crazy man'. Now, at 24, his ambition is to take new cultivation methods back to his coffee and vanilla-growing village.

Eusebio Gomes, 28, has already joined with other students to form their own non-government organisation to demonstrate new farming technologies – which can be as simple as planting in rows instead of casting seed randomly over the ground.

The feeling of the students was summed up by 24-year-old Aluiziu Assis, who is impatient to take his knowledge of animal disease and vaccines back to his home town, Manatuto: "We are optimistic for a very important reason," he says. "We have already shown we can make change happen." ■

KEEPING THE WORLD'S SUGAR SWEET

The scientists knew the threats were out there – and now they know where. A three-year project funded by ACIAR has for the first time mapped the distribution of pests and diseases that threaten wild sugarcane growing in Papua New Guinea, parts of the Torres Strait, and the province of West Papua (Irian Jaya) in Indonesia.

Sugarcane originated from the New Guinea island, and a rich diversity of wild germplasm from the genus *Saccharum* grows there still. The germplasm is important for traditional purposes and for breeding new, improved varieties for sugar production in PNG, Indonesia, Australia and the rest of the world.

The destruction of forests through logging and reliance on artificial sweeteners are taking their toll, but pests and diseases pose the most serious threat to the germplasm's long-term survival. The spread of these scourges is also a risk for commercial sugar production in Australia, PNG and Indonesia.

Some serious pests and diseases occur in Australia and other parts of Indonesia, but not on the New Guinea island. Conversely, the island has its own host of dangers that could wreak havoc elsewhere. Scant knowledge about the distribution of the pests and diseases, however, made it difficult to determine the potential for spread, and to develop effective controls.

In an effort to fill in the blanks, Australian, PNG and Indonesian scientists collaborated in a project mapping diseases and pests across the region. The collaborating institutions were Ramu Sugar Ltd in PNG; the Indonesian Sugar Research Institute; BSES Ltd in Australia; and the Australian Quarantine and Inspection Service. The project ran from June 2000 until December 2003. It included surveys and studies on indigenous sugar species, their pests and diseases and resistance; training of professional staff from PNG and Indonesia in Australia; workshops for quarantine staff in PNG and the Torres Strait; workshops for laboratory and field staff in Indonesia; and study by graduate students in Australia.

The risk of exotic pests and diseases being introduced into the region is significant, with Indonesian plans to establish commercial sugarcane crops in West Papua using plants sourced from Java. Other quarantine risks have been identified and the project has highlighted these to the authorities in each country. Hybrid cultivars, sourced from commercial plantations, were found in some PNG household gardens, raising the risk of pests and diseases spreading to disease-free areas.

The survey provided valuable insight into the nature of the threats. For example, *Eumetopina flavipes*, the insect vector for the debilitating Ramu stunt (a disease endemic in PNG), was found on most Torres Strait Islands and on the Australian mainland at Bamaga near the tip of Cape York. There was no sign of Ramu stunt, however, and the discovery of the planthopper in just a couple of gardens in Bamaga, coupled with its isolated occurrence in the Torres Strait, suggests it could be eradicated from the Australian mainland.

Ratoon stunting disease (RSD), a major global sugarcane disease, was not found during the PNG survey, but has since been identified on the commercial estate at Ramu Sugar, near Lae, PNG. The disease is a threat to wild germplasm, and further surveys to determine whether it has spread are a priority. Ramu Sugar plays an important socio-economic role in the Ramu Valley, which was an undeveloped area 25 years ago but is now home to 10,000 people with schools, roads and health services.

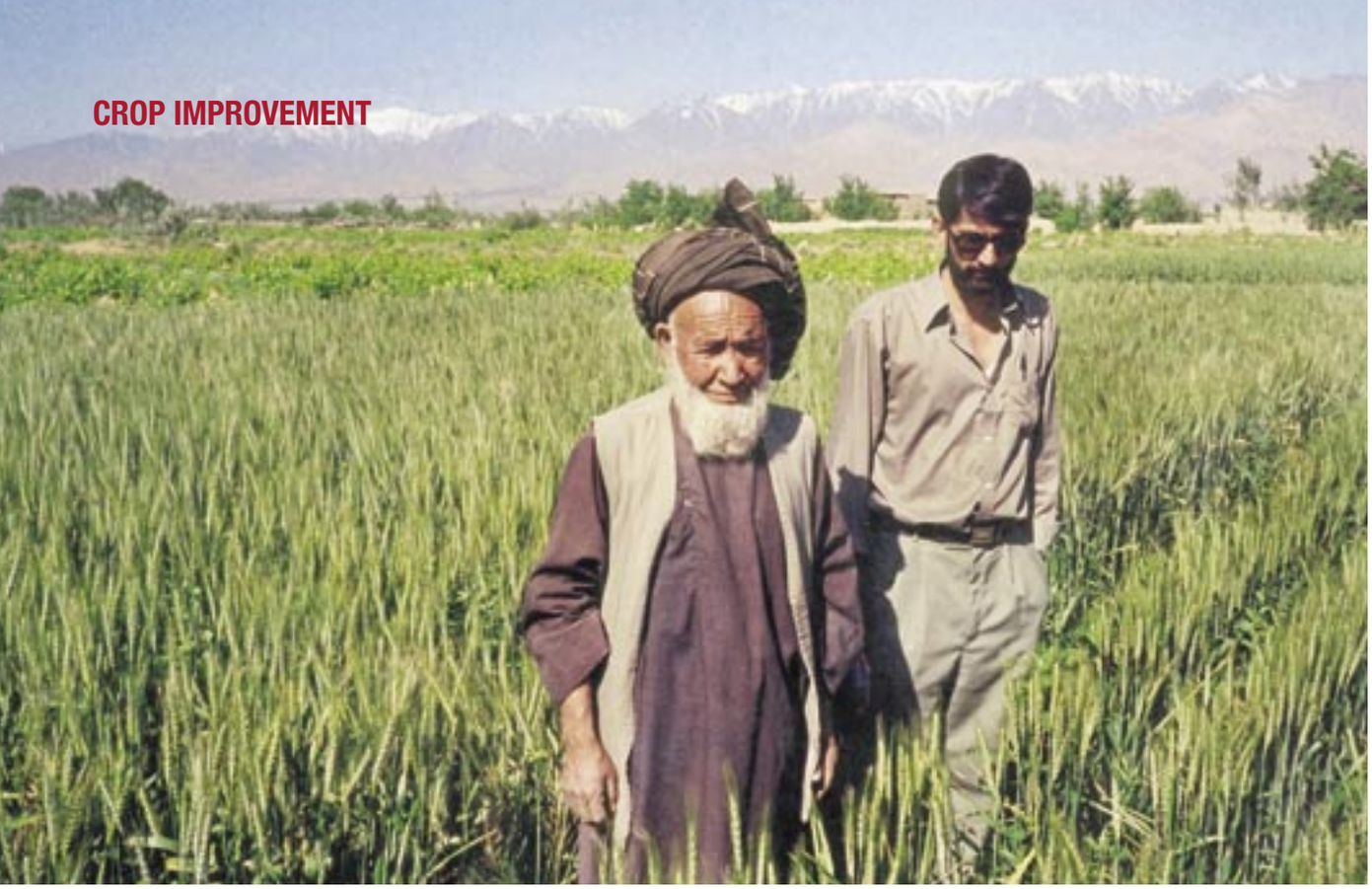
Disturbingly, the survey also discovered plants with sugarcane mosaic-like symptoms that did not test positive to diagnostic assays. The identity of the pathogens associated with this condition is unknown, and further research is essential.

The project successfully promoted community awareness of the importance of quarantine. Posters were distributed in English, Motu and Pidgin. Brochures in Bahasa Indonesian were distributed to communities during the Indonesian survey.

An external review of the project's progress and achievements was undertaken in the last six months of 2003. The review scientists said the project had achieved positive social, environmental, economic, capacity building, and scientific impacts. Following their recommendation, ACIAR has agreed to extend the project until December 2005. ■

PROJECT:
CIM/1996/140 Biological threats to Saccharum germplasm and sugar production in Papua New Guinea, Indonesia and Australia

Contacts:
ACIAR, Dr Colin Piggin, Research Program Manager Crop Improvement and Management, *piggin@aciar.gov.au;*
Project leader, Dr Robert Magarey, Bureau of Sugar Experiment Stations, Australia, +61 07 4068 1488, *rmagarey@bses.org.au*



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

Efforts 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, inplemented 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 Humanitaarian 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".

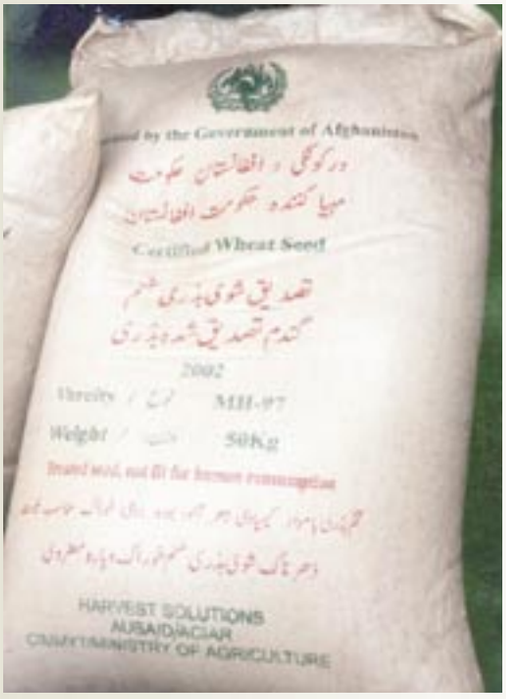
Farmers using the new technology have reported yields of up to two to three times higher than their neighbours.

"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@aciar.gov.au*
Project leader, Dr Sanjaya Rajaram, CIMMYT, Mexico, +52 55 5804 2004, *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

The 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.

The 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 Khumultar, 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 Piggin, Research Program Manager, Crop Improvement and Management, +61 02 6217 0527, *piggin@aciar.gov.au*
Project leader, Dr Clive Francis, Centre for Legumes in Mediterranean Agriculture, +61 08 93801878, *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@aciar.gov.au*
Project leader, Dr Geoff Auricht, SARDI, +61 08 8303 9498, *auricht.geoff@saugov.gov.au*

10 years of achievement

ACIAR's program of activities began in Vietnam in 1993 and is now entering its second decade. Initially activities focused on building scientific capacity in Vietnam. Much of this was centred on research and scientific institutions in Ho Chi Minh City and Hanoi.

Training to build scientific capacity is still a priority, though increasingly the focus is on provincial institutions.

The current strategy for Vietnam emphasises research to assist the enhancement of smallholder incomes, through crop and livestock diversification within farming systems, and by improving market access through lifting the quality of and safety of agricultural commodities.

For example, research into improving pig breeds has delivered animals now much more suited to Vietnamese conditions. An independent economic assessment estimated the net present value of this research as half a billion Australian dollars to the Vietnamese economy, with much of this going to farmers and villagers.

Other project successes include: improvements to rice-shrimp farming and inland pond and small reservoir culture fisheries, non-chemical control of rodents in rice crops, fast-growing acacias and introducing improved Leucaena for animal fodder, better irrigation and control of citrus pests.

Many of the technologies arising from these and other projects are being applied and capacity in R&D developed and extended through the AusAID Capacity building for Agriculture and Rural Development Program.

The initial ACIAR program and its evolution has been built on consultation and collaboration. Formal consultations are held every four years, to set research priorities. The aim is to establish the main priorities that act as the framework for subsequent, and more regular, informal talks.

The most recent of these consultations, in February this year, set a new framework of priorities for research projects and proposals, and their evaluation.

A mix of priorities emerged, with an increased focus on central Vietnam and its coastal regions. Implementing the results of earlier ACIAR-supported research, including practical measures to communicate these to farmers, is also a major priority.

Many of the research and extension priorities relate to the transition of the Vietnamese economy and agricultural sectors to a market oriented economy, and the potential for research to deliver genuine and secure returns to smallholder farmers during this transition phase.

Details are available through the ACIAR website at *www.aciar.gov.au* and priority areas for the coming year can be found in the ACIAR Annual Operational Plan, also available through the website (see story on page 31). ■

BREAKING THE POVERTY TRAP FOR SMALL FARMERS

By CLAIRE MILLER

A decade after the Vietnamese Government granted limited land rights to its people, many rural families are still struggling to break free from the poverty trap. Their plight is contributing to a widening income gap between rich and poor, country and city.

The failure of many household farms to move from subsistence farming into the cash economy can be traced to their small size and limited off-farm opportunities to earn income, according to research by Australian and Vietnamese agricultural economists. The findings have important implications as the Government considers rural development and land policies it hopes will boost rural household incomes.

The Vietnamese are a rural people. About 80 per cent of the population lives in the country, and there are more than 11 million household farms. In 1986, the Government began to deregulate and liberalise the economy. The reforms included reinstating family farms as the main unit of agricultural production rather than highly centralised collectives.

A steady overall reduction in poverty followed the economic reforms and in the past decade, Vietnam has not only achieved self-sufficiency in rice production, but has grown into the world's second-largest rice exporter.

This said, prosperity is uneven. The gap between rural and urban income is widening. Poverty is concentrated in rural areas. Landlessness and poor households with small landholdings are becoming more widespread.

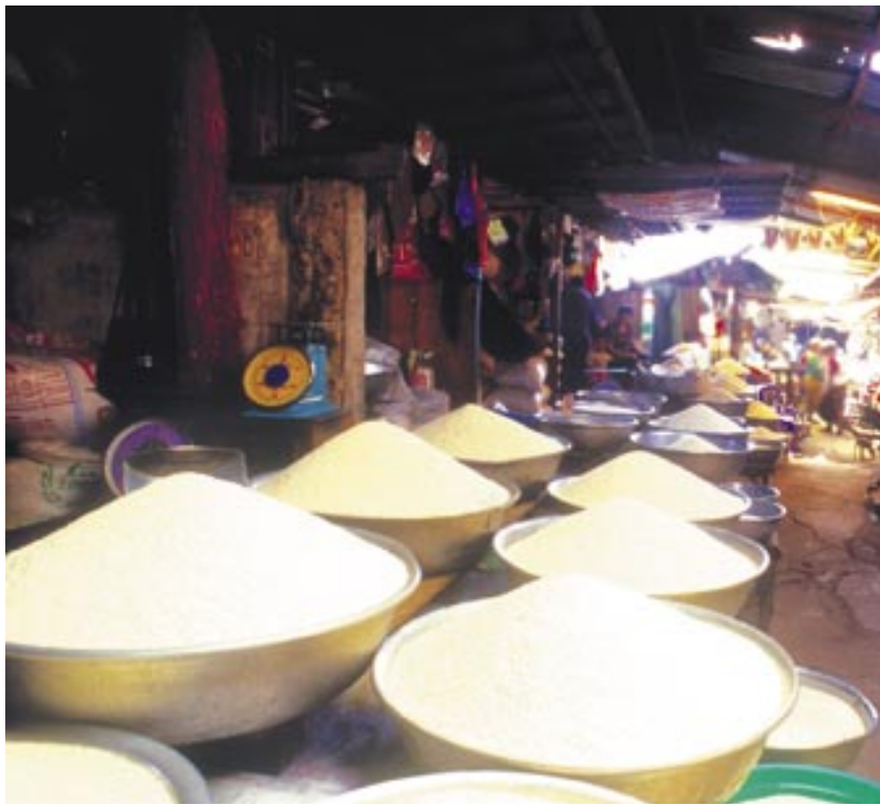
In 2000, economists from the University of Sydney and Hanoi Agricultural University surveyed 400 households in four provinces, two each in the south and north. This survey and follow-up work identified three main factors associated with rural poverty: small farms, low socio-economic status, and limited opportunities to earn off-farm income.

Equity between households was a primary objective when the Government began allocating land in 1993. It took into account land quality and household population. It was also concerned that anyone who wanted to farm could do so.

Consequently, the amount of land granted to each household is generally small. Even so, circumstances vary markedly between households, and from one province to another, underlying the need for flexible rural development policies.

For example, farms in the south typically consist of one or two plots, but in the north are spread over eight, nine or many more. The Government has encouraged consolidation, believing this will boost productivity, but the policy may disadvantage households in mountainous regions where many plots reflect different land types and crop choices, and contribute to a more diverse agriculture.

Most farms surveyed were between 0.5 and 1.5 hectares, although some were less than 0.1 hectares and others more than 10 hectares. In general, low socio-economic status was linked to smaller, less productive farms. Poor households in Ha Tay province near Hanoi have lower educational levels and about half the land area of more prosperous households. In the remote mountainous province of Yen Bai in the north west, poor families have one-fifth the land of their richer neighbours, but their net value of production is higher per hectare. Larger farms, however, have the advantage of spare land for cash crops.



'VIETNAM HAS NOT ONLY ACHIEVED SELF-SUFFICIENCY IN RICE PRODUCTION, BUT HAS GROWN INTO THE WORLD'S SECOND LARGEST RICE EXPORTER.'

Most rural households rely on off-farm earnings to boost household income. Off-farm income sources include handicrafts, pensions and remittances, providing services, permanent and casual labour. These activities boosted the median level of total household income by 32 per cent in Ha Tay and up to 106 per cent in Binh Duong province, near Ho Chi Minh City. This shows the extent to which off-farm income contributes to raising the incomes of the poorer 50 per cent of households.

There is, therefore, an urgent need for economic reforms to stimulate more off-farm employment. Off-farm enterprise and services in rural areas are critical for poverty reduction in the future. Greater flexibility in land use is also critical. The World Bank says government production policies on commodities like rice are limiting the ability of farmers to diversify in response to market signals. ■

Contact:
Dr Gordon MacAulay, The University of Sydney,
+61 2 9351 2574, *g.macaulay@agec.usyd.edu.au*

'Farm income and income diversity on Vietnam's small household farms': paper delivered to the 48th Annual Conference of the Australian Agricultural and Resource Economics Society, 11-13 February 2004. Authors: Sally Marsh, Pham Van Hung, Nguyen Quoc Chinh and T. Gordon MacAulay.

FRUIT FLIES GET A TASTE FOR BEER

Win-win: New fruit fly control in a protein paste made from waste brewing-yeast.

Beer is a popular choice for many Vietnamese drinkers, and it would seem that local fruit flies are partial to a drop as well – which is why the Fosters Brewery in Tien Giang Province has just built a special waste processing plant.

The plant will turn yeast waste, a by-product of beer production, into a bait to trap fruit flies.

Fruit flies are the most damaging invertebrate pest for agriculture in southeast Asia. In Vietnam, crop losses attributed to fruit flies can be 100 per cent, and farmers in some areas routinely expect to lose up to 95 per cent of each year's peach crop to these pests.

The only control that has been proven as a deterrent is to drench crops with chemical sprays. The prevention, however, is in many ways worse than the damage, with potential human health and environmental problems arising from inappropriate chemical use and residues in food. Also, other invertebrates are killed along with the flies, including natural predators of the fruit fly.

The practice also becomes a trade barrier, limiting the economic returns that should be coming from the potentially valuable horticulture industry.

Waste yeast has few uses, and can be an environmental problem. Now the development of a bait utilising waste yeast has emerged as a win-win because it also provides a use for the waste.

Australian scientists at Griffith University's International Centre for Management of Pest Fruit Flies, supported by ACIAR and the Crawford Fund, came up with an answer that was innovative and attractive to all parties, including the fruit flies.

By treating the brewery waste with heat and enzymes, it is converted into a protein which is highly attractive to flies. When diluted with water and a minuscule amount of insecticide, the protein can be applied as a small dollop on to a tree. It is simple to apply, inexpensive to produce, and most importantly, it controls the fruit flies.

The brewery waste solution had already been proven, through an ACIAR project in Tonga that developed the waste processing technology, but several barriers had to be overcome for its use as a pest control.

The main challenge was getting the formula right to ensure the yeast waste produced at Tien Giang would attract fruit flies.

The first step was a fruit fly species survey, using traps and host fruits to collect flies and determine which were the problem species. This was important for getting the formulation right.

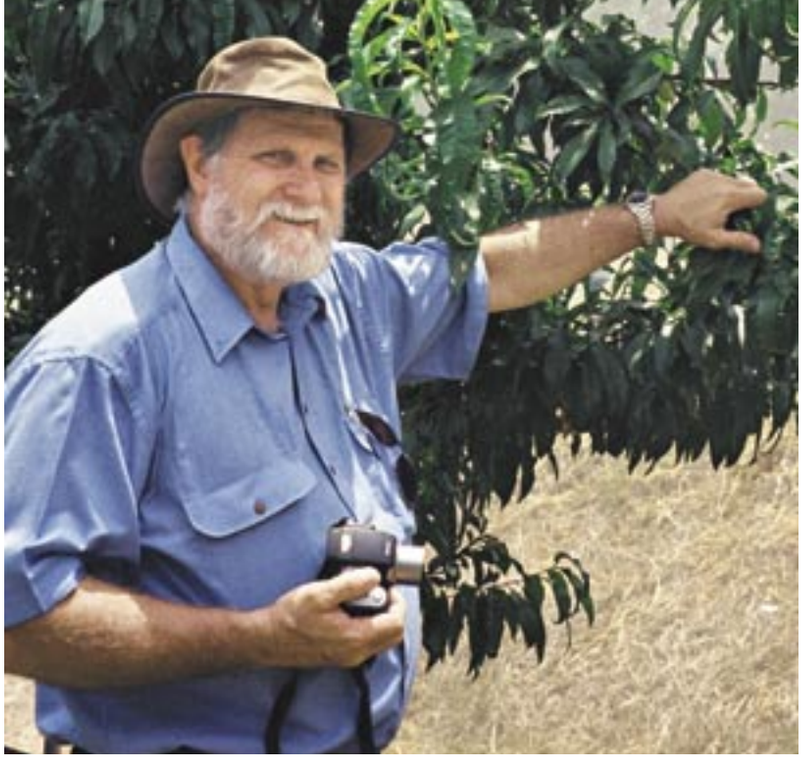
The other step was finding an industry partner. Fosters was keen and BASF (formerly Aventis) also became involved by providing funds.

Local farmers near the Fosters Brewery then took part in trials and training in the use of the baits.

The successful collaboration between science, government and industry culminated with the official opening of the plant, on 16 April 2004 by the Australian Ambassador to Vietnam Mr Joe Thwaites and the Chairman of the Tien Giang People's Committee.

In areas where farmers were losing hope of ever controlling the fruit fly pest, optimism has returned. ■

PROJECT:
CP/1998/005 Managing pest fruit flies to increase production of vegetable and fruit



Net gain: QDPI&F researcher Bob Nissen inspects netted peach trees at Khunwang research station in northern Thailand.

CONSUMER CONCERNS DRIVE ALTERNATIVE METHODS

Consumer and environmental concerns over pesticide use and residues are driving attempts to develop alternative treatments. In Vietnam, with extensive networks of canals and watercourses running through farming land being used for producing food, for bathing and washing clothes, the possible presence of pesticide residues is a genuine issue of concern. Using baits is just one approach.

Physical barriers that exclude flies, thereby preventing them from laying eggs in fruit, provide a non-chemical *alternative* method. In countries where labour costs are low, this might involve wrapping individual fruit in paper bags to protect them from fruit fly and other insect pests. On a larger scale it might involve covering the whole tree.

As part of an ACIAR-supported project to develop a low-chill fruit industry in Thailand, Laos and Vietnam, researchers from the Queensland Department of Primary Industries & Fisheries are testing a small-mesh netting to fully enclose individual trees when fruit are susceptible to attack. A two-millimetre mesh net made from long-lasting translucent fibre that minimises the shading factor is being used. The netting has the potential to significantly reduce pesticide usage in high-value crops.

An added benefit is that fruit quality and yields appear to be significantly increased under the exclusion netting. Fruit maturity is advanced by about 7 to 10 days due to the higher temperature under the netting. A significant increase in the number of potential markets that have fruit fly-free status is a major benefit of using total exclusion netting. ■

PROJECT:
CIM/2001/027 Adaptation of low-chill temperate fruits to Australia, Thailand, Laos and Vietnam

Contact:
ACIAR, Dr Colin Piggin, Research Program Manager, Crop Improvement and Management, +61 2 6217 0527, *piggin@aciar.gov.au*

STOPPING RODENT NUMBERS FROM GROWING WITH RICE CROPS

Lush rice paddies cover almost half of all agricultural areas in Vietnam, presenting an appealing picture of productive farming to locals and visitors alike.

But one local is not seen by farmers in such a positive light – the rice field rat (*Rattus argentiventor*). Each year rats spoil this idyllic image by causing preharvest losses of between five and 10 per cent.

Farmers have considered this a part of agricultural life, some devising ingenious and novel traps to capture the odd rat, but lacking a unified, village-level response.

Changes in the Vietnamese rice industry since the early 1990s have boosted rice production beyond 34 million metric tonnes (2002). In part this has been based on intensifying rice production from two to three crops a year.

Rat population cycles coincide with rice production, with young rats maturing as rice crops mature, ensuring a plentiful food source. Intensifying to three rice crops a year has provided a significant boost to rat numbers. Cropping areas with high rat damage increased from 50,000 to 310,000 hectares between 1993 and 1997 alone.

ACIAR has supported several projects addressing rat damage in rice crops throughout Southeast Asia over the past decade. These have demonstrated an integrated approach as the best solution to stopping rat damage. The combined project work, led by CSIRO, established a five-pronged approach:

- **use of the Community Trap Barrier System (CBTS) – utilising a series of carefully spaced lure crops planted prior to the main cropping cycle, and surrounded by a barrier and traps to catch rats and break the breeding cycle;**
- **Integrated Rat Management (IRM) at the village level, including synchronising cropping and fallow periods;**
- **forecasting and ecology of rodent populations, such as through surveys;**
- **biological controls; and**
- **establishing a rodent network and delivering training through this.**

This research formed the basis of an AusAID-funded 'Capacity-building for Agriculture and Rural Development' (CARD) project in the Mekong Delta region, facilitating Vietnamese capacity in rodent management, and a sub-project of the ACIAR–World Vision collaborative project, to facilitate farmer uptake of project results, in this case in Binh Thuanh province.

A soon-to-be-published Impact Assessment Series Report of these two projects and their ACIAR-supported predecessor have shown significant benefits flowing to Vietnam. The study determined that while the CTBS has had limited adoption, mostly on larger farms with higher rat populations and more resources, IRM has had a widespread impact.

IRM has formed the basis of both national and provincial government policies. At the national level, the Vietnamese policy directs farmers to practice IRM, including, where practical, adoption of the CTBS. At the provincial level, budget allocations for the implementation of the policy have been provided. This will result in more CTBS demonstrations and extension of IRM to other provinces. ■

PROJECT:
AS1/1998/036 Management of rodent pests in rice-based farming systems

Contact:
ACIAR, Dr John Copland, Research Program Manager, Animal Sciences 1, +61 2 6217 0544, *copland@aciar.gov.au*

NEW SOYBEAN VARIETIES PROMISE A BUMPER HARVEST

Increasing Vietnam's national production of soybeans from around 200,000 tonnes a year to a million tonnes a year by 2010 is a Government goal, driven by projections in demand and being able to meet this domestically.

Bridging the significant gap between current production and what is needed to meet future demand can be helped by more suitably adapted varieties. This is the aim of an ACIAR project 'Soybean adaptation and improvement in Vietnam and Australia'.

The project has identified the genetic material to overcome the two main barriers to increased production; the very short growing season and varieties poorly matched to local conditions.

Soybean is used in Vietnam primarily as livestock feed, although it can also be used to add diversity to rice-dominated human diets. This domination impacts on the growing season of soybeans, which is usually squeezed in as an opportunity crop between rice. As a result the soybean summer growing season is very short, and does not provide enough time for the plants to mature. High seasonal rainfall, rather than full maturation, signals the end of the growing season as the soybean has to be harvested before rain causes seed quality to deteriorate.

Many varieties grown by farmers are also poorly suited to their agro-ecological conditions. This further reduces yield. Compounding these factors is lodging, when leaves and plants bend, break or sag during growth. Farmers assume lodging will occur, so the density of their planting is far below optimum – further eroding yields.

Increasing yield potential is linked to the size of a plant's canopy: the larger the canopy, the larger the yield. The canopy grows throughout the plant's life cycle, but most growth occurs during the plant's final stage – which, under Vietnamese circumstances, is shortened.

However, some soybean varieties are able to manage a truncated season through a mechanism that allows extra growth prior to the maturing stage. This is achieved through a 'long juvenile gene', which enhances the growth of some characteristics, including the canopy, in the juvenile period. Increasing the level of activity of desired traits during the juvenile growing period can compensate for the time constraint put on soy crops by farmers' rice priority and the weather.

Previous scientific research, some of it supported by ACIAR, has developed models that predict the impact of long juvenile genes on canopy and other growing conditions. Phenological characteristics of the life cycle, and the impact of long juvenile genes on these characteristics, can be used as a basis for plant selection. Characteristics examined included photoperiod (daily exposure to light) and temperature responses.

The project team accessed germplasm with desired traits, such as tolerance to frost, extreme temperatures and acidic soils, to match agro-ecological conditions. These varieties were also evaluated for the right long juvenile genetic traits and then introduced, through hybridisation, into existing lines.

Varieties tested previously in Thailand by ACIAR-supported research, and shown as suitable for Asian growing conditions, were also trialled. The trials showed that the long juvenile gene can be bred into varieties suitable for Vietnamese agro-ecological conditions, and that these will increase potential yield by maximising growth in a shortened season.

The best of these varieties have yield potentials of between 1.4 and 2.7 tonnes per hectare. Most farmers currently use varieties which yield about 1t/ha.

An added bonus of the new varieties is their suitability for growing conditions as diverse as the northern highlands and the Red River valley, which expands the area where soybean crops can be grown.

A larger soybean harvest will give farmers much needed extra income, both through crop sales and improved animal health as more soy is utilised as feed.

The modest, but significant, yield gains may, however, just be the start. Trials in which 'best practice' (higher plant density using lodging-resistant cultivars and improved water and fertiliser use) is also being applied are showing that yields could go as high as 5t/ha.

The genetic and plant physiology mechanisms that determine traits such as adaptation for temperature and photoperiod response, drought tolerance and weathering (the viability of germination) are also well on the way to being better understood. Vietnamese scientists are involved in this work, building their knowledge and capacity so they can take over the job of incorporating desired traits into breeding lines in Vietnam.

ACIAR is now looking at the best ways to ensure that the new varieties are made widely available. One of these may be assisting in the development of a seed delivery plan that taps into Vietnamese Government and NGO initiatives at the farmer level. This and other work to encourage the release of seed to more Vietnamese farmers is likely to be supported through an extension of the project.

This additional support would also continue the development of Vietnamese scientific capabilities, passing on the mantle to Vietnam for further research and extension.

While this project has produced high hopes for soybean production in Vietnam, it also looks like having a valuable spin-off in Australia. One new variety, bred with the long juvenile gene and improved resistance to drought and weathering, has now been released in north Queensland. ■

Economic growth: Vietnamese pigs are now maturing faster.

PROJECT:
CIM/1995/130 Soybean variety adaptation and improvement in Vietnam and Australia
Contacts:
ACIAR, Dr Colin Piggin, Research Program Manager, Crop Improvement and Management, +61 2 6217 0500, *piggin@aciar.gov.au*
Project leader, Mr Andrew James, CSIRO Plant Industry, +61 07 3214 2278, *andrew.james@pi.csiro.au*

A BETTER SWEET POTATO LEADS TO A BIGGER PIG

How do you make a pig grow faster without feeding it more food? That was the question facing researchers from Vietnam and Australia in a recent ACIAR project, also involving Indonesia. The Vietnamese component of the project is now finished, with the focus of remaining research now shifting to Indonesia.

Pigs are important for food security and vital to the domestic economy, particularly in northern and central Vietnam. Pigs are allowed to forage for food, and are also fed from crops, mainly sweet potato, to increase growth rates.

The traditional sweet potato-pig farming system has been a source of food stability, but it has been unable to provide income available from the expansion of commercial returns from raising pigs. So the beginnings of a move from a traditional to a commercial approach to raising pigs was put in place.

The big question being asked was, how can pigs grow faster when the farming system does not provide for additional food?

To maximise commercial returns, farmers need pigs to mature faster, as a way of saving input costs and time.

Management practices for growing sweet potato and raising pigs offered little hope for improvement, because they were already highly advanced.

However, one weak link identified was the sweet potato varieties, many of which have limited nutritional value to pigs.

This area was seen as the finishing touch to the transition from traditional pig raising to a more commercial enterprise. An ACIAR-supported project, involving SARDI and the International Potato Centre, addressed this issue.

The introduction of improved sweet potato varieties became the research focus in Vietnam.

Unlike the Indonesian leg of the project, little needed to be done to improve the management practices for sweet potato-pig systems in Vietnam. Instead, two quality factors needed improvement – higher starch and protein yields.

Any increases in either would result in faster growth rates for pigs.

The improved varieties introduced and tested during the project lived up to their promise. Yield increases of root starch and leaf protein increased by 100 per cent. This resulted in pigs fed on the new varieties increasing their growth rates by 20 to 30 per cent.

The increased growth rate halved the cost of raising pigs, which is measured through the cost per kilogram of weight gained. This fell by 40 to 50 per cent, and each dong saved during growth now stays in the farmer's pocket.

Spreading the message has relied on the willingness of local farmers to pass the information on to their fellow farmers, although a manual has now been produced. Farmers and trainers have attended workshops, which has helped establish a network throughout parts of northern and central Vietnam, based on disseminating knowledge stemming from the project.

The network is also being used to distribute clones of the improved sweet potato varieties. With the commercial returns and savings on offer to farmers demand is growing quickly.

And so are the pigs. ■

PROJECT:
AS1/1998/054 Poverty alleviation and food security through improving the sweet potato-pig systems in Indonesia and Vietnam
Contacts:
ACIAR, Dr John Copland, Research Program Manager, Animal Sciences 1, +61 2 6217 0500, *copland@aciar.gov.au*
Project leader, Dr Dai Peters, *d.peters@cgiar.org*

Getting results: hill tribe farmers growing peach trees with cabbages.

New awareness: vegetable growers harvesting cucumbers that can be sold as 'pesticide free' in local supermarkets.

Planting vegetables under plastic: the sheeting not only acts as mulch, but also deters pests.

TAKING R&D FROM VISION TO REALITY

By ROBIN TAYLOR

Wading rivers to reach remote communities, crossing a (collapsing) suspension bridge high across a valley and travelling 10 kilometres on the back of a motorbike along a rough track to an otherwise inaccessible community, were experiences Terry Davis may not have been expecting when he agreed to review a series of ACIAR projects. Davis was one of a three-member review team.

The ACIAR–World Vision collaborative project 'Facilitating farmer uptake of ACIAR project results' could be described as one big experiment, furthering the outcomes of a number of ACIAR projects in Thailand, Laos and Vietnam. Three of the projects were based in Thailand – reducing pesticide use on vegetables in key watershed areas of the Songkla Basin; profitable fish farming through utilisation of low-cost feeds; and high-value, low-chill, temperate fruit for hill areas of northern Thailand.

The other projects were: rodent control in rice crops using integrated pest management techniques; improvement of soil fertility for crop production in Bac Binh province, Vietnam; and improving crop yields in rainfed rice-based systems in the central lowlands of Laos.

After reviewing the projects, Mr Davis, an agricultural consultant from New South Wales with extensive experience in developing countries, discussed some of the challenges facing ▶

both ACIAR (as a facilitator and funder of agricultural R&D) and NGOs, such as World Vision (as facilitators of community development), in putting agricultural R&D to work.

He says cooperation between a technology provider and an NGO with strong community contact was a significant advantage when introducing new practices, because it helped to spread the outcomes of research to more farmers: "It is a way of addressing the divide between generating new technology and its uptake".

The review found that the ACIAR–World Vision project was very successful, with five out of the six components producing results above expectations. Some of the questions both organisations will be asking, in planning for future cooperation are, "what worked and what didn't … how can we do it better in future … and, has it reached its full potential".

In his review, Davis found that synergies and symbiosis between the participating groups brought benefits to both organisations as well as to the end users.

For research partners the benefits were:

- more feedback on the suitability of their technology;
- broader testing of the technology; and
- better leads as to future directions and better-trained extension workers.

"A lot can happen in a short time when you put a provider of appropriate technology alongside an organisation with community contacts," says Mr Davis. "Without this program, adoption of these technologies would not have been as substantial. In some cases they achieved more than people thought possible."

In the Songkla Basin in the south of Thailand, a previous ACIAR project had shown that chemical runoff was contaminating drinking water. The World Vision team worked with farmers whose livelihoods depend on vegetable production. Together they were able to change horticulture practices to decrease chemical use without affecting their viability. For example, chemical fertiliser was partially replaced with diluted chicken manure. The manure was soaked in a tank of water overnight and the liquid run into a drip irrigation system under plastic mulch.

Adoption of these methods has led to a three to four-

A HELPING HAND FOR THOSE MOST IN NEED

World Vision's Graham Tardif likens Thailand's north-eastern provinces to a drain. Life is so grindingly hard and the prospects for improvement so poor, that people are leaving their villages in droves in search of the means of survival elsewhere. They often do not want to go, but choice is rarely part of the equation.

Tardif, World Vision's ACIAR program coordinator, says people in such poverty hotspots need drastic intervention to help turn around their fortunes. "The way they have always been doing things hasn't brought them out of poverty," he says. "We are working in areas where the poverty is so entrenched that they need something quite drastic to kick them out of it."

ACIAR is helping to provide that vital 'something' through its collaborative research partnership with World Vision. Tardif says the partnership is accelerating the uptake of new agricultural technologies, crop varieties and cultivation techniques in desperately poor communities that might otherwise wait years for the information and benefits to filter through.

World Vision's field staff as well as farmers benefit from the direct link to senior agricultural experts. They and local agricultural extension officers learn how new systems work from demonstration plots, rather than second-hand through journals, and get invaluable advice during regular visits by project scientists. Agency staff can then spread the knowledge to other communities they are working with around the country.

Without the partnership, Tardif says the process of dissemination would take much longer, cost much more, and leave many more families to fall victim to the poverty trap. Poverty is a home-breaker. Parents leave their families for months, often years, to work overseas, or in cities. Children are denied their future, forced by the family's deepening debt spiral into working rather than attending school.

In Thailand's north-east province, the path to the debt treadmill is well-worn. Farmers sell their rice crop before it is harvested at a drastically reduced price to pay debts. The reduced income is not enough for the household to survive on, so they have to borrow more, often from local rubber plantation owners.

As the cycle deepens, more and more family members, including children, are forced to work at the plantation to pay off the household debt.

Tardif says the answers must compete with the money family members might get by migrating to work in city bars, plantations or overseas. "You have to put in something pretty drastic, and that is a new crop, or a higher-yielding crop, or something at least to guarantee they have food and nutrition … and these are areas where normal things have failed."

ACIAR projects have helped families get off the treadmill by introducing new cash crops. In Vietnam, rural families have saved money and their health by learning how to use farm chemicals properly. In Laos, where malnutrition is a problem, impoverished households are growing high-yielding staple crops that help them not only to feed themselves, but earn cash from the surplus.

"The partnership is a major benefit for all of them and for us at grassroots level," says Tardif. "But ACIAR also benefits. It is able to strengthen the application of its research, to ensure the benefits reach those poor families and communities most in need of assistance with improved agricultural technologies and practices.

"ACIAR does not really have the contacts at community level, but works through government extension officers. Through our community contacts, we provide areas for testing outside Australia where the people are already accept the presence of NGOs. It is helping people to help themselves" ■

– CLAIRE MILLER

Contact:
Graham Tardif, World Vision program officer, 1300 303 287, *graham.tardif@wva.com.au.*

fold reduction in the use of chemical fertilisers and herbicides, and an increase in farmers' incomes because their input costs are lower. As well, farmers have marketed their own 'pesticide-safe' label in local supermarkets for a 20 per cent price premium.

A rubber-tapper who was growing vegetables on an opportunity/part-time basis was trained in the low pesticide technology, and through membership of a small revolving credit group formed by World Vision, he was able to buy the drip irrigation equipment and other inputs. His first crops were so successful that he has now moved into full-time farming, with his wife adding value by selling cooked corn-on-the-cob at local market days.

He proudly explained to the evaluation group that he was now a trainer for other farmers joining the pesticide-safe program.

World Vision, with the continued support of ACIAR's original research partner, the Prince of Songkla University, hopes to expand the program into neighbouring provinces. By September 2003, it had directly benefited more than 500 families and indirectly benefited another 2000.

In Mr Davis's opinion, the most successful project was improving the profitability of fish farming using low-cost feeds. This project, based in the Udon Thani and Surin provinces of north-east Thailand successfully demonstrated that fish production with the support of community enterprises supplying low-cost inputs (feed and fingerlings) will increase food security and incomes.

The project's aim was to establish individual and community fish farms to improve food security and provide income (through sales of surplus fish and fish feed).

Ingenuity: A vegetable grower demonstrates his simple tool for cutting planting holes in the plastic sheeting used as a mulch. Hot charcoal is placed in the tin can which is then pressed onto the plastic sheet.

Persuasion: Weaning farmers off the excessive use of pesticides has been an ongoing campaign. Dr Kong Luen Heong holds up a poster that was part of an awareness program by the International Rice Research Institute (IRRI).

Initiative: Fingerlings being raised for sale to farmers building their own small aquaculture ponds.

The project involved demonstrating and training in aquaculture technology at a community centre, showing how to build household-size ponds, and expanding this at a community level to the construction of large, community operated fish ponds. The Thailand Department of Fisheries provided technical support and training.

The initial activity included a market survey that established there was local demand for freshwater fish. When purchased feeds are used, the profit margin for fish farming is low, so an earlier ACIAR project developed methods to replace commercial diets with diets produced from locally available materials.

The World Vision collaboration enabled the distribution of 'how to' guides for preparing these diets and the financing of small pelleting machines.

Community centres are now operating in Udon Thani and Surin and training courses have been run at both centres for fish breeding and production of low-cost, farm-made feeds. About 600 people have built small household ponds. Experiments comparing the homemade diets with commercial diets have demonstrated similar or better growth and feed conversion ratios than commercial pellets.

Rodent control has been the focus of a number of ACIAR projects as rats are a major threat to rice crops in many countries. Using the community trap barrier system developed by CSIRO in an earlier project, the collaborative program with World Vision established several demonstration groups in the Bac Binh province in Vietnam. The system involves planting an enclosed lure crop, which ripens before the main crop, to attract rats which are then trapped in cages inside the lure crop. The demonstrations showed the viability and economic value of the system. The demonstrations have been so successful that Binh Thuan province has asked for help to expand the system to all districts.

"The challenge is to raise living standards but we also have to increase the skill of rural communities to manage change. This means being adaptable so that farmers can change the technology to suit their local situation," says Mr Davis.

Another project in Bac Binh province demonstrated significant yield benefits from changing the fertiliser practice and variety selection in peanut production on infertile sandy soil.

The fifth component, introducing high-value, low-chill temperate fruit to the hill areas of northern Thailand, builds on the successful introduction of subtropical stone-fruit varieties, including plum, peach and nectarine in other parts of northern Thailand. These fruits achieve high prices in the Bangkok markets and are potentially a profitable alternative source of income for hill tribes in the region.

As part of the World Vision extension project, 18,000 tree seedlings were distributed to more than 1000 families near Chiang Rai, although results are not expected for several years.

World Vision is now looking at ways farmers can generate income in the short term, such as growing vegetables and other cash crops, intercropped with the fruit trees.

The project to improve crop yields in rainfed rice-based systems in Savannakhet, Laos, has trained and mobilised district extension workers to form farmer groups involving 157 farmers in 32 villages and to support them in undertaking on-farm variety/fertiliser trials.

Mr Davis says that to maximise the benefits of their collaboration, ACIAR and World Vision need to extend their expertise into participatory technology development – to build more learning opportunities into the project process and to follow project design through to the longer term.

Once this has been done at the organisation and management level, more support needs to be given to field teams to help them understand and implement the participatory approach, to come to grips with the new agricultural technology, and to monitor, evaluate and report on the process.

The projects and the review have highlighted areas where ACIAR is trying to maximise the benefits from the agricultural research it funds.

Mr Davis says that future work with NGOs and farmer groups would need scope to include capacity building, which at the moment was not being covered. The project also presented challenges for the World Vision field teams who needed to learn technologies vastly different from their previous experience. ■

PROJECT:
CTE/2000/165 Facilitating farmer uptake of ACIAR project results: World Vision collaborative program

A model project

RESEARCH THAT HELPS AFRICAN FARMERS UNDERSTAND AND COPE WITH CHANGE IS ALSO BRINGING BENEFITS TO AUSTRALIANS, REPORTS **JANET LAWRENCE**

An ACIAR project that set out to improve African smallholder farming systems, has given rise to a new means of using computer simulations to aid thinking about risk and change.

The models proved valuable to researchers in Africa – and have led to a new approach that assists Australian farmers in their planning and decision making.

From 1983 to 1993, ACIAR funded research to address key challenges of farmers in the African and Australian semi-arid tropics. Scientists from Kenya and Australia focused on locations in eastern Kenya and Australia's Northern Territory – both regions known for infertile soils and low, erratic rainfall.

In Kenya, food security was under frequent strain due to a rapidly growing population and declining soil fertility. But the uncertainty of rainfall was a significant disincentive for farmers to spend money on productivity investments.

The research team aimed to find ways to increase productivity that farmers judged to be both practical and affordable, and followed a 'farming systems research' strategy to work with farmers in this search.

Researchers sought to understand the constraints experienced in a typical farm household and how these affected farm management decisions.

After discovering that the project's original theme of using forage legumes to improve soil nitrogen was unfeasible due to small farm size and high cropping intensity, attention turned to the economics of modest amounts of nitrogen fertiliser.

Experiments within farmers' crops, supplemented by studies on research stations, focused on the economics of soil fertility enhancement.

The key challenge was the ▶

A MODEL PROJECT IN SOUTHERN AFRICA

Maize is a staple crop in southern Africa and about 70 per cent comes from smallholder farms of less than five hectares, virtually all of which are rainfed. Erratic rainfall is a major constraint to the introduction of improved technologies for smallholder farmers.

This project was designed to develop and test a set of tools and methods that would improve farmers' understanding and adoption of crop management strategies for environments subject to climatic variability and risk.

The aim was to show farmers, through the use of simulation models and other information technology, the longer-term consequences and risks associated with continuing current practices compared to trying recommended alternatives.

The project employed the Australian-developed APSIM (Agricultural Production Systems sIMulator) for technology testing and farmer experimentation.

The design of the project was built around three principal tenets:
■ methodology development in the integration of the APSIM systems modelling package to be integrated with farmer participatory research (FPR);
■ climatic risk is the principal constraint on the adoption of new technology; and
■ the potential of the project to link other CIMMYT maize activities in southern Africa.

The FPR work found that farmers' first priority was how to allocate scarce labour, capital and nutrient resources across different land types rather than worrying about how to adapt to climatic risk.

Central to the project was the application of APSIM, utilising the model in technology testing and farmer experimentation in Malawi and Zimbabwe (see story page 25). To achieve this the project had to assemble appropriate data sets, characterise the structure and constraints on smallholder maize systems, validate the principal elements of the model involved in simulating that structure and constraints, and apply the model against farm level data.

The project built on previous calibration work and secondary data sources to speed up the application. This approach was sound, but there are limits to utilising "representative" data sets in on-farm applications. A recommendation is that future work returns to developing a minimum data set to capture intra and inter-farm variability.

African farming is complex. However the on-farm research suggested that phosphorus and manure availability were key to farm constraints and farmers' decision making.

As the project focus shifted to farmer priorities on soil and resource management, new needs were identified, in particular the role of legumes in soil fertility management. The APSIM group extended the modelling into this area, although more validation is warranted, drawing on a wider array of existing data. ■

PROJECT:
SMCN/2001/028 Development and scaling out of targeted recommendations for smallholder maize systems in Southern Africa through integrating farmer participatory research and simulation modelling (Risk Management Project 2)

fickle rainfall climate. For farmers it meant that low soil nitrogen prevented high yields in seasons of good rainfall, but household investment in fertiliser was risky because of the unreliability of the rainfall.

For researchers, the challenge was that experiments long enough to quantify risks and test options, greatly exceeded the likely duration of the project. So the researchers turned to computer simulation as a possible way of reducing this constraint.

ADAPTING A MODEL

The practice of crop modelling using computers was just beginning to show its usefulness back in the late 1980s. A computer software model called CERES-Maize had been developed for high-input agriculture in North America, where maize is farmed under relatively favourable and reliable conditions.

In the ACIAR project, the scientists set out to adapt the model to predict maize yields for the severe soil and climatic conditions of low input systems in the semi-arid tropics.

The scientists based their tests and modifications on data from both old records and new field experiments in Kenya. The result was a model named CMKEN (CERES-Maize for Kenya), the child of CERES-Maize.

This model could realistically simulate the yields of maize crops grown on soils with different water holding characteristics in response to daily rainfall (or irrigation) and to the addition of different amounts of nitrogen.

It could also show the relative performance of plants grown at different densities, and how different maize cultivars would perform in each situation.

Development of the model gave the scientists a tool to make 'what if?' comparisons between a wide range of practices and strategies for growing maize at different locations, particularly with respect to returns on scarce household capital invested in nitrogen fertiliser.

It helped them to gain many insights into aspects of maize production in the Machakos and Kitui districts of Kenya.

Their simulations demonstrated that even in the highly risky environment of semi-arid Kenya, farmers could lift crop yields through water conservation and improved soil fertility, and this was affirmed by successful trials using the recommended practices.

Although risky in the short term, it was evident that nitrogen fertiliser was a good medium-term investment.

This finding was independently and impressively validated in the practice of a small number of farmers.

The impact of the project on African farming is not easy to gauge, but there is evidence of influence on the way research is now conducted by some of the Kenyan scientists and by some CGIAR centres. Certainly, it had a profound and enduring effect on the Australian research team.

The use of simulation as part of a farming systems research approach had shown its usefulness, and by the end of the project the scientists believed that it was ready to be applied more widely, wherever unpredictable rainfall constrained agriculture. In the ensuing years this has proven to be the case, as the Australian project leader, Dr Bob McCown, testifies. ▶

"Our participation in the modelling work in Kenya was an ideal opportunity for CSIRO scientists to discover the potential of simulation modelling as a tool for thinking about farming practices," he said recently.

"Being able to simulate crop and cropland performance allows greater possibilities in 'experimentation', trying out ideas over periods of time much greater than the lifetime of a project and trying things that are simply not feasible in the field.

"And when you simulate situations together with farmers it increases the reality of representation, and the involved farmers are more ready to recognise the simulation output as meaningful to their thinking and actions."

MODELS AS RESEARCH TOOLS

The CSIRO team's modelling work has progressively evolved in Australia, augmented by collaborative research in India, Zimbabwe, and South Africa.

"But it was the ACIAR project that reinforced our need for models as research tools, provided support for their development and gave us a vision of the potential of this approach to help Australian farmers," Bob McCown says.

In 1990 this team was part of a joint initiative of the Queensland Departments of Primary Industries (DPI) and Natural Resources (DNR) and CSIRO Tropical Agriculture in creating APSRU (the Agricultural Production Systems Research Unit). Its purpose was to benefit Australia, its northern region in particular, through innovative systems approaches to research and development (R&D) in rural industries.

APSRU's core expertise and research technology is in crop and soil management and in the computer simulation of farming systems.

Central to the Unit's activities is APSIM (Agricultural Production Systems sIMulator). The APSIM modelling framework has many advantages.

It has a modular framework, whereby any logical combination of modules can be simply specified by the user 'plugging-in' required modules and 'pulling out' any modules no longer required. The original modelling work concentrated only on maize. Now many other crops can be studied, as well as a much expanded suite of environmental constraints and management interventions.

ACTION RESEARCH WITH FARMSCAPE

APSRU has engaged farmers in relevant R&D by direct action with them and indirect action via advisers and consultants.

The FARMSCAPE (Farmers, Advisers, Researchers, Monitoring, Simulation, Communication, And Performance Evaluation) action research program evolved to learn if and how simulation can be useful to farmers and farming consultants.

FARMSCAPE is about agricultural knowledge – both practical and scientific.

These two sides meet in FARMSCAPE when a farmer 'does an experiment' using a scientific model made to look like an actual paddock of his or her farm and, as a result, either alters their practice or decides not to.

FARMSCAPE is an approach to farming systems research that comprises:

'IN KENYA, FOOD SECURITY WAS UNDER FREQUENT STRAIN DUE TO A RAPIDLY GROWING POPULATION AND DECLINING SOIL FERTILITY. BUT THE UNCERTAINTY OF RAINFALL WAS A SIGNIFICANT DISINCENTIVE FOR FARMERS TO UNDERTAKE THE NEEDED INVESTMENT IN PRODUCTIVITY.'

'SIMULATIONS DEMONSTRATED THAT EVEN IN THE HIGHLY RISKY ENVIRONMENT OF SEMI-ARID KENYA, FARMERS COULD LIFT CROP YIELDS THROUGH WATER CONSERVATION AND IMPROVED SOIL FERTILITY, AND THIS WAS AFFIRMED BY SUCCESSFUL TRIALS USING THE RECOMMMENDED PRACTICES.'

- on-farm monitoring to ensure local relevance;
- computer simulation to feasibly explore alternative management possibilities; and
- discussion to explore possibilities informed by the different perspectives of farmers, advisers, and researchers.

FARMSCAPE represents a shift in systems thinking. Formerly, computers were seen to compensate for shortfalls in managers' understanding and consequent decision-making. Now, computers aid the construction of new understanding that opens up new possibilities for farm management.

'TOYS' TURNED TO FARMERS' TOOLS

Farmers on Queensland's Darling Downs were at first sceptical and dismissive of models as 'toys for scientists'.

But after working in league with the scientists and advisers they have come to realise that the 'toys' can be tools that uncover new possibilities relevant to certain farming challenges.

The farmers started to take computer simulations seriously when they could relate them to the climate, soil and management situations with which they were dealing. The models passed their tests of credibility by adequately simulating events they had experienced.

They undertook a process of yield benchmarking – why the crop behaved as it did and how a different outcome could have been achieved through altered management actions.

Farmers know that their crop performance will vary from year to year. Until recently, they could only know the outcome of a poor season through painful experience, but with modelling, the odds can be quantified. A significant number of farmers are now aligning their plans with simulation-based forecasts.

What is now understood about the Southern Oscillation Index (SOI), which greatly influences Australia's rainfall patterns, has helped the scientists to refine their models and increase the accuracy of predictions.

But they are adamant that farmers must realise that their soil is the central focus of their enterprise. They hope that information they provide about soil type, and how weather and crops influence the soil, will contribute to farmers' understanding of what drives farming systems and open them to new ways of increasing water capture and use.

After 12 years of research to create an approach to computer-aided planning and decision-making that 'works' in farm management practice, current research focuses on developing (1) sustainable institutions for delivery of FARMSCAPE tools and services; and (2) better theoretical understanding of the interface between systems research practice and farm management practice.

APSIM, with its user-friendly interface, flexible graphics tool and database tool for storing, manipulating and sharing soil properties data, has developed from a single-crop simulator into a comprehensive simulator of farming systems. Its portfolio of applications grows as new needs arise.

Farmer clients now come from Queensland, northern NSW, Victoria and Western Australia. They meet in groups on the internet, where they can see

screens, discuss possibilities and do experiments.

Simulation modelling is providing a unique bridge between the knowledge of agricultural science and the know-how of farming practice. APSIM's starting point was crop and soil process research, now its major focus is on mobilisation of human learning and planning skills.

APSIM and FARMSCAPE represent progress in new capabilities that has received global recognition, prompting other major agricultural and farming systems research institutions to re-engineer their models from the ground up and trial new ways of using them.

Bob McCown believes that it would not have happened without the ACIAR project that began in 1983, with its major focus on farming in eastern Kenya – together with a project philosophy in ACIAR that allowed space for project transformation as learning took place. ■

Contact:
Project leader: Dr Robert McCown, QDPI&F Agricultural Production Systems Research Unit, CSIRO Sustainable Ecosystems, PO Box 102 Toowoomba QLD 4350, 07 4631 4390

The author acknowledges the advice and assistance of ACIAR project leader Dr Bob McCown and other project team members in the preparation of this article.

Widening their decisions: farmers from the Hwedza district in Zimbabwe inspect a tropical legume, Lablab purpureus, used as an improved fallow. Photo: **Bruce Pengelly**.

'AN AUDACIOUS THING TO DO'

Using cropping systems models with commercial farmers in Australia is one thing, but could these same tools be applied with smallholder farmers in southern Africa?

"It was an audacious thing to do," says APSRU leader Peter Carberry, when a group of computer simulation modellers teamed up with participatory researchers (agronomists, economists and social scientists) and local researchers to use the FARMSCAPE approach with smallholder farmers in Zimbabwe.

The group worked with 30 farmers in the village of Mkhubazi, Tsholotsho for three days. Many of the farmers had never even seen a computer before, let alone used a cropping systems model. Hand-drawn diagrams on flip charts were used to help describe a computer model. A notebook computer was displayed to the group and the idea of using the computer to ask 'what if' questions was proposed. If maize was planted in a field with a small amount of manure and yielded two bags, what yield would the computer suggest with more manure? Or with inorganic fertiliser?

Actual rainfall and simulated crop yields for a number of crops in past years were presented as hand-drawn graphs. Immediately after the graphs were presented, Sevi, a female farmer, asked the question: "Why is the sorghum yield in a year with more than 800 millimetres rainfall less than the yield in a year with only 480mm?" This broke the ice for discussion about a range of issues.

Selected case studies were conducted for four farmers. In the first case, results were simulated for growing maize, with no manure or fertiliser and then with application of manure. When a farmer commented that the variety used was not suitable for their area, Carberry was able to run the model again using the preferred variety. The new runs were completed within minutes and the changes in bags per acre were presented on flip charts. Good discussion followed.

While new simulations were being run, farmers were asked to nominate what change they would expect from, for example, application of manure or inorganic fertiliser; many started debating among themselves the likely outcome. Once the farmers could see their experience reflected in the simulated output for a change in maize cultivar, for example, the model gained credibility and they were willing to proceed with further simulations.

As a result of the workshop, farmers identified recordkeeping of yields and rainfall as something important they had learnt. They also asked for access to seed and fertiliser so they could increase productivity in the ways discussed.

The farmers in Mkhubazi subsequently implemented and managed trials investigating manure and inorganic nitrogen interactions, legumes and their responses to phosphorus.

At the beginning the researchers were sceptical that simulation could be directly relevant to smallholder farmers, but by the third day they were enthusiastic about the opportunities to use this approach. ■

PROJECT:
SMCN/1999/003 Integrated nutrient management in tropical cropping systems: Improved capabilities in modelling and recommendations

With WTO accession, increasing trade liberalisation and many developing countries seeking to enter new export markets, the role of economic modelling has grown. Like computer simulation modelling for cropping, economic modelling provides decision makers with an understanding of complex scenarios, based on real issues.

Being carried into a new era: a street scene in China.

THE WORLD LEADS CHINA IN A NEW DIRECTION

By CLAIRE MILLER

Trade liberalisation in China is forcing a policy rethink about how to achieve food security and reduce rural poverty in the world's most populous nation. China to date has equated food security with self-sufficiency, and pursued policies to that end.

In the past, China has experienced famines and struggled to finance large food imports. These concerns have been used to justify agricultural protection, subsidies and monopolies in the name of self-sufficiency and equitable distribution. However, food security is not the same as self-sufficiency. A three-year collaborative project funded by ACIAR suggests that policies aiming for total self-sufficiency are costly, do little to reduce rural poverty and do not necessarily improve food security.

The project involved researchers at the Australian National University and the China Centre for Economic Research at Peking University in Beijing. The researchers analysed the policy implications for food security of China joining the World Trade Organisation.

WTO membership will lead to structural adjustments across all economic sectors. Some activities inevitably will be reduced, with a loss of employment, lower asset values and reduced income. Agriculture and agricultural employment is expected to be one of those sectors negatively affected, but counter-intuitively, the reforms may also increase, rather than decrease, food security.

The researchers defined food security as whether households have sufficient income to maintain an adequate diet. They acknowledged that a nation as populous as China will always have to produce most of the food its citizens eat, but their models suggest that aiming for total self-sufficiency stifles economic growth and perpetuates rural poverty when analysed from an economy-wide perspective.

Modelling shows the main factors in reducing rural poverty, as in most developing nations, will be the scope for rural households to earn off-farm income, and for people to take advantage of new employment opportunities in industries with a comparative advantage.

In China's case, trade liberalisation is expected to create more jobs in light manufacturing, services, transport and other sectors, offsetting reduced employment and income from a more efficient, less protected agricultural sector. Dislocated agricultural workers will be able to take advantage of the jobs growth in other sectors, while rural ▶

'Achieving Food Security in China: Implications of WTO Accession.' Paper presented by Ron Duncan, Emeritus Professor, School of Economics, Australian National University to the 48th Annual Conference of the Australian Agricultural and Resources Economics Society, Melbourne, 11-13 February 2004.

households can increase their total income through greater opportunities for off-farm work.

Trade reforms will also cause consumption to switch away from home-produced goods in favour of imports. This will cause the relative prices of the home-produced goods to fall and become more affordable to a growing urban working class.

The research indicates that the success of the trade reforms will depend on policies outside agriculture as much as structural reforms within the sector. For instance, the Government has discouraged people from moving off farms into urban centres, partly out of concern about the problems associated with increasing urbanisation such as congestion and pollution.

However, the restrictions on movement have led to an oversupply of rural labour, compounding the widening income gap between city and country, and coastal and inland regions. The restrictions may also be retarding economic growth, especially in the inland provinces, which are the least industrially developed, least urbanised and least attractive for investors.

Researchers X. Wang and R. Duncan found a positive correlation between urbanisation, economic growth and rural incomes. Their modelling indicated that each percentage point increase in urbanisation boosts provincial economic growth rates by 0.37 percentage points above the already high 7 to ten per cent growth rate.

The important message from the research is that macro-economic and other non-specific agricultural policies will do much to help rural households maximise the benefits of trade reforms.

Non-agricultural policies include supporting urban development and private enterprise in inland regions, with better planning and infrastructure to cope with larger populations. Monetary policy and capital controls should also be gradually and cautiously relaxed to promote non-agricultural jobs growth.

In agriculture, there will be a need to abandon price supports and regional self-sufficiency policies, and to reform marketing and distribution monopolies. ■

Contact:
Professor Ron Duncan, *duncan_r@usp.ac.fj*

HELPING TO FIGHT THE FLAB IN FIJI

The name 'Fiji' conjures an image of idyllic beaches and a healthy, open-air lifestyle – which might be the case for thousands of tourists who flock to the popular Pacific island each year. However, daily life can present a very different scenario for many native Fijians and Indo-Fijians.

Changing lifestyles and diets have led to a growing health problem with significant personal and social costs, and no easy answers – obesity.

Obesity in Fiji results from a unique mix of social, cultural and economic factors, according to Dr Phillip Hone, senior lecturer in Economics from the School of Accounting, Economics and Finance at Melbourne's Deakin University.

Dr Hone presented a paper, 'Food Choice and Nutrition in Fiji', to the 48th Annual Conference of the Australian Agricultural and Resource Economics Society, held in February earlier this year in Melbourne.

In the paper, he pointed out that obesity was not a new problem for Fiji, but changes in the types of food now commonly consumed, coupled with a significant shift from rural to urban lifestyles, has meant that a substantial – and growing – number of the 800,000-strong population can be classified as overweight or obese. This is leading to an increase in diseases such as cardiovascular disease, diabetes, hypertension and some cancers.

The most recent national survey in 2001 indicates that obesity is more prevalent among females than males, Fijians than Indo-Fijians, and urban dwellers than rural dwellers.

"Over time, people are tending to move from relatively low paid, physically demanding lifestyles in the country to relatively highly paid, sedentary lifestyles in the city," says Dr Hone. "As their incomes grow, they can afford more food and they are tending to shift their consumption pattern away from [traditional] foods with high nutrient density towards higher calorie foods [such as refined cereals and sugar products]."

The question now being raised is can a government influence personal choices in food consumption and exercise? Dr Hone believes it is almost impossible to reverse the pattern of less physical activity coupled with a higher calorie intake, but there are steps that can be taken to moderate the rate of obesity growth and the cost of obesity prevention.

One of those measures is education and information. There is an active campaign to educate Fijian school teachers in nutrition principles, and the study of basic nutrition is part of the syllabus at government schools. The government also funds nutrition field staff operating at the local community level, supported by the National Food and Nutrition Centre.

Then there are policies such as taxes, tariffs, import duties, research funds and government subsidies for local producers that can influence food prices. Dr Hone's study indicates that price is an important factor underpinning food choice. He points to the 2001 survey on food preferences in Fiji. The study found that Indo-Fijian families lived on a predominantly rice and flour-based diet because of a liking for the products and perceived value for money. For Fijians, cassava (a starchy root-vegetable), rice and bread were the most frequently consumed staples because of perceived value and ease of preparation.

"In developing countries, people on constrained budgets are sensitive to changes in relative food prices," says Dr Hone. "This sensitivity needs to be considered when government is reviewing food, taxation and agricultural policy settings. However, the relationship between food intake, obesity and disease is complex and care needs to be taken in assessing public intervention."

The health-related costs associated with obesity are high, especially for countries like Fiji where public capital is scarce. Diverting more funds to treat conditions like diabetes and heart disease means less money for other health programs, education, law and order.

Dr Hone believes the cost of obesity prevention can be reduced through careful policy analysis, and that the effort will pay off. He says the potential magnitude of the obesity problem is enough to suggest that the return from such analysis could have a substantial impact on Fijians' quality of life. ■

Contact:
Dr Phillip Hone, *hone@deakin.edu.au*
Dr Hone is one of the organisers of a nutrition workshop to be held in Suva, Fiji, from June 28-29.

KEEPING THE REEF FISH TRADE HEALTHY

By HELEN EVA

Under threat: a marine biologist inspects coral reefs damaged by illegal fishing. Photo: **AAP**

The live reef fish trade in the Asia-Pacific is as sensitive and delicately balanced as the marine environment upon which it depends. Factors such as over-fishing, harmful harvesting techniques, regional economic setbacks and disputes between suppliers are all impacting on this relatively new and specialised market.

And while the trade has created income-generating opportunities for many countries, the benefits have come at a cost to future ecological, economic and social sustainability.

Keen to address these issues, ACIAR funded a project on the Pacific trade in the 1990s and has also funded a number of mariculture (aquatic farming) projects of live reef fish species in Indonesia and Vietnam. A related ACIAR-supported project to conduct an economic analysis of the trade will begin soon.

A paper, 'Economic modelling of the live reef fish trade in Asia-Pacific', was presented at the 48th Annual Conference of the Australian Agricultural and Resource Economics Society held earlier this year in Melbourne. The authors were Dr Elizabeth Petersen, Research Associate from the University of Western Australia; Mr Geoffrey Muldoon, Research Associate from the CRC Reef Research Centre at James Cook University in Townsville; and Dr Brian Johnston, Visiting Research Fellow at the Australian National University.

They presented a picture of a valuable, but disjointed, industry in need of a cohesive approach to supplying the main live reef fish markets of Hong Kong, mainland China and Taiwan. The authors pointed out that, while live fish have long been traded throughout Southeast Asia as a luxury food, fish captured on coral reefs did not enter the trade until the 1970s, and it was not until the 1990s that many Pacific countries began supplying the major markets.

Since then reef fish have become highly sought for their taste and texture.

As a high value-to-volume fishery, the industry has flourished over the past few decades, with Hong Kong imports alone worth about US$350 million a year. It is estimated that 60 per cent of the international trade goes to Hong Kong, with as much as 50 per cent of this being re-exported to southern mainland China. About 20 countries in the Asia-Pacific region now supply these markets, with China, Thailand, the Philippines, Australia, Malaysia and Indonesia being the dominant sources.

However, as demand remains steady, there are concerns about supply and the lack of regulations and data in many of the trading countries.

Over-exploitation of coral reefs has now become a major threat to reef fish numbers, particularly when large numbers of reef fish that have gathered for spawning, are harvested.

Concern about this overfishing has seen some growth in farmed or maricultured reef fish, with up to 40 per cent of the live fish trade now relying on this source. But with more and more wild fish being caught before reaching maturity, and grown-out in cages until they are market size, fish-farming is also contributing to the decline of wild populations.

There is also an environmental risk from the use of cyanide to stun fish so they are easy to catch. It is illegal, but widely practised, and potentially fatal for coral.

The use of cyanide also contributes to the high mortality rates during shipment to markets. Up to half the catch is dying before it reaches the retailer. Most deaths are attributed to the use of cyanide, overstocking cages, feeding practices and disease.

With as many as five links in the chain from fisherman to retailer, the industry is also beset by social disruption, arising mainly from disputes over resource access and use, distribution of benefits and the use of destructive fishing practices.

The new ACIAR-supported project for an economic analysis of the trade will more fully explore theses issues.

Reef fishers and managers should then benefit from information on supply and demand, cost analysis and risks.

ACIAR mariculture projects – and mariculture industries in general – will benefit from information on consumer preferences; and information on fishing practices and ways of improving market performance will be provided to key decision and government policy makers. ■

Contact:
Geoffrey Muldoon, Research Associate from the CRC Reef Research Centre at James Cook University, Townsville, *g.muldoon@impac.org.au*

COUNTRY OFFICES – BUILDING NETWORKS ON THE GROUND

A key component of ACIAR's successful partnership approach is having people on the ground in partner countries. While this includes regular visits from ACIAR's Australian-based staff and project personnel, Country Offices provide a permanent presence.

ACIAR has seven Country Offices in Australian Embassies and High Commissions in Papua New Guinea, Indonesia, Thailand, Vietnam, the Philippines, China and India. Although they were originally established to provide administrative support, the role played by Country Offices has evolved over time.

Prior to the establishment of ACIAR Country Offices, support for ACIAR activities in partner countries was provided through overseas missions, mainly by AusAID (then AIDAB) personnel on an ad hoc basis. As ACIAR's programs grew in the region a more permanent solution was sought, with the first Country Office set up in Thailand in 1984. Since that time, offices have been opened in nine countries, with those in Malaysia and South Africa closed as programs in those countries have wound down.

The role of the Country Office has changed dramatically since 1984. Today, Country Offices provide advice to ACIAR on in-country program development, including agricultural development priorities, appropriate research, development and extension partners and regional issues. They also assist with monitoring and evaluating specific projects, and with the transitions in programs as they mature and enter new phases of operations.

As an example, the Thailand office is currently managing a reduced ACIAR program in that country, while also managing the expansion of a program in Cambodia, a small program in Laos and the development of a new program in Burma. Communicating with stakeholders is a key to the success of these programs, including ensuring administrative needs are met. The roles of Country Offices fall across four broad themes:

- communicating ACIAR's role and activities, including project benefits;
- managing and maintaining productive relationships;
- project support and administration, including to staff and project personnel; and
- representing ACIAR and the Australian Government.

Typically a range of stakeholders exist in-country. Interactions between these and ACIAR are detailed in the table below.

Gathering and disseminating information from and to these stakeholders, building networks to support all the offices' activities and managing existing relationships are all vital to fulfilling the role expected of Country Offices. Individual offices must also negotiate a range of cultural and political contexts in managing these relationships.

As the roles of Country Offices have evolved over the past two decades, the value and importance of them has been strengthened and recognised – as a presence that builds and maintains the relationships so vital to ACIAR's partnership mode of operation. ■

IN-COUNTRY STAKEHOLDER INTERACTIONS

Country Government	Building awareness of ACIAR's role, project priorities, development, monitoring and evaluation, delivery of benefits, administrative support
Australian Government	Supporting linkages with other Government organisations, linkages within the Embassy
AusAID	Supporting project and program linkages, information sharing and gathering
Donors – domestic and international NGOs	Building awareness of ACIAR, identify and support linkages
Domestic research institutions	Project development and administrative support, training, logistics, project benefits
Australian research institutions	Project development and administrative support, benefits of projects
Others	Local media stories – TV, print, radio, farmer groups

Cecilia Honrado

PHILIPPINES OFFICE RECOGNISED

The important role played by ACIAR's Country Offices is also recognised by research institutions and governments in partner countries. An example is the award recognising the Philippines Country Office and Country Manager Ms Cecilia Honrado, given by the Philippines Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), late last year.

Ms Honrado was awarded a Certificate of Appreciation from PCARRD. The citation stated: "For her continuous commitment and dynamic leadership as ACIAR Manager – Philippines in the pursuit of agriculture and natural resources R&D. Her staunch support has helped PCARRD pursue R&D in agricultural and natural resources."

The award was presented in recognition of a decade's work for ACIAR, acting as a vital link between the Centre and its Philippines partner.

At the same event, held to coincide with PCARRD's 31st anniversary of operations, ACIAR was also recognised, receiving the Tanglaw Award for best institution. The award for ACIAR was: "In grateful acknowledgement of its strong commitment and outstanding contribution in strengthening scientific and technological cooperation between PCARRD and ACIAR. Such cooperation undoubtedly has resulted in enhancing the R&D capabilities of participating institutions from both countries in addressing agricultural problems and constraints in production."

The Australian Ambassador to the Philippines, Ruth Pearce, praised ACIAR and Ms Honrado for the awards: "I am pleased that both ACIAR and its Country Manager Ms Honrado are being recognised by PCARRD. ACIAR's collaborations with PCARRD and other agencies have made an invaluable contribution to agricultural growth and development in the Philippines. Cecilia embodies the dedication of all those involved in maintaining this outstanding partnership." ■

NEW PROJECTS (FEB – MAY 2004)

ADP/2000/072 – Improving resource use efficiency in the coconut industry of North Sulawesi and its national implications

ADP/2002/047 – Trade liberalisation, agriculture and land degradation in Fiji: implications for sustainable development policies

AS1/2002/108 – Improved management of small mammals in Tibetan grasslands

ASEM/2003/010 – Farmer evaluation and multiplication of sweet potato varieties on the North Coast of PNG

FIS/2001/075 – Sustainable aquaculture development in Pacific Islands region and northern Australia

FIS/2002/111 – Culture, capture conflicts: sustaining fish production and livelihoods in Indonesian reservoirs

LWR/2002/113 – Application of innovative irrigated cropping and soil filtration technology for wastewater reuse and treatment in China

SMCN/2002/033 – Seasonal climate forecasting for better irrigation system management in Lombok

SMCN/2002/034 – Refinement and adoption of permanent raised bed technology for the irrigated maize-wheat cropping system in Pakistan

SMCN/2002/093 – Intensifying production of grain and fodder in Central Tibet farming systems

PROJECT EXTENSIONS AND VARIATIONS (FEB – MAY 2004)

ACIAR projects may be varied to extend the time to completion, to increase the budget available or both. Project variations and extensions are undertaken following a review process of the project, that involves both internal and external review phases.

ASEM/2000/088 – Redevelopment of a timber industry following extensive land clearing

AS1/2000/083 – Development of a vaccine for the control of Gumboro in village and small poultry holdings in Indonesia

AS1/1997/115 – Increasing efficiency and productivity of ruminants in India and Australia by the use of protected nutrient technology

AS2/2000/103 – Developing an integrated production system for Bali cattle in the eastern islands of Indonesia

AS2/1998/025 – Performance evaluation and genetic improvement of ruminant animals in the Philippines

CP/2000/043 – Huanglongbing management for Indonesia, Vietnam and Australia

CTE/2000/165 – Facilitating farmer uptake of ACIAR project results: World Vision collaborative program

FST/1994/019 – Genetic diversity and propagation of mangroves

LWR/2001/001 – Improving main system water management in China: a demonstration project in the Zhange Irrigation Scheme

PHT/2000/102 – Selection for improved quality and resistance to Phytophthora pod rot, cocoa pod borer and vascular-streak dieback in cocoa in Indonesia

SMCN/2000/089 – Permanent beds for irrigated rice-wheat and alternative cropping systems in north-west India and south-east Australia

NEW PUBLICATIONS

PROCEEDINGS

Modelling nutrient management in tropical cropping systems
An end-of-project workshop proceedings, focusing on improving capabilities in crop modelling for tropical cropping systems. The objective of this project was to use data from a range of sites in the tropics to test and improve the capability of the Agricultural Production Systems sIMulator (APSIM) computer model to predict the decomposition of various organic inputs, the dynamics of nitrogen and phosphorus in the soil and crop yields. **Delve R.J. and Probert M.E.** (eds) 2004. ACIAR Proceedings 114, 138pp. Price: $22 (plus postage and handling).

Tropical legumes for sustainable farming systems in southern Africa and Australia
Most of the papers in these proceedings come from a final meeting of an ACIAR project to develop sustainable animal and cropping systems in southern Africa, based on the integration of well-adapted forage plants and appropriate agronomic and animal management practices. The project team has selected forage plants that could be introduced into the degraded grasslands of South Africa and Zimbabwe to improve animal production. **Whitbread A.M. and Pengelly B.C.** (eds) 2004. ACIAR Proceedings 115, 180pp. Price: $22 (plus postage and handling).

TECHNICAL REPORTS

Cooperatives: issues and trends in developing countries
A number of developing countries have shown interest in cooperatives as a way for smallholders to obtain some market power, especially where old institutions have disappeared or are losing their relevance. This report covers the broad range of issues and trends associated with cooperatives, drawing on relevant experiences of developing and developed countries. **Trewin R.** (ed.) 2003. ACIAR Technical Reports 53, 88pp. Price: $15 (plus postage and handling).

Contract farming in Indonesia: smallholders and agribusiness working together
This report presents the results of a survey-based analysis of contract farming in Lombok and Bali. As developing countries continue on the path of economic liberalisation, there is an urgent need to bring the benefits of new trade and market opportunities to rural areas. Smallholders often do not have access to capital, marketing information and institutional support. One possible mechanism for improving their livelihoods and providing them with the benefits of economic liberalisation is contract farming. **Patrick I.** 2003. ACIAR Technical Reports 54, 72pp. Price: $15 (plus postage and handling).

Chromolaena in the Asia-Pacific region
Chromolaena (Siam weed) is a serious weed which has spread from its original home in the West Indies to large areas of Africa and Asia. It is now considered a major weed threat to Australia. Chromolaena has many enemies and biological control has long been recognised as a control option. This book contains papers presented at the 6th International Workshop on Biological Control and Management of Chromolaena and looks at a number of the control agents which have been tested. **Day M.D. and McFadyen R.E.** (eds) 2004. ACIAR Technical Reports 55, 52pp. Price: $13 (plus postage and handling).

WORKING PAPERS

Mud crab aquaculture in Australia and Southeast Asia Allan G. and Fielder D. (eds) 2004. ACIAR Working Paper 54, 70pp.

Agricultural research and poverty alleviation: some international perspectives Ryan J. 2004. ACIAR Working Paper 56, 32pp.

A survey of marine trash fish and fish meal as aquaculture feed ingredients in Vietnam Edwards P., Le Anh Tuan, Allan G. (eds) 2004. ACIAR Working Paper 57, 56pp.
All papers available at *www.aciar.gov.au*

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POLICY ADVISORY COUNCIL

ACIAR's Policy Advisory Council (PAC) held its 24th meeting in Canberra from 24-26 March. The meeting was an opportunity for representatives from ACIAR partner countries and Australia to discuss issues relating to agricultural research and their implications on the Centre's operations.

The PAC provides advice to the Minister for Foreign Affairs, and ACIAR, on agricultural problems in developing countries and ways to resolve them. This advice includes identifying problems, constraints to solving them, national and regional research priorities and modes of operation to match Australian expertise to these priorities.

The Council met the Minister for Foreign Affairs, the Hon. Alexander Downer, at a dinner on Tuesday evening, 23 March, prior to the official start of proceedings.

A key component of the meeting was discussion and feedback on ACIAR's draft Annual Operational Plan for 2004-05. The perspectives of the PAC members are an important input into the development of the Plan, released in June.

Invited speakers at the meeting included Dr Mary Harwood, executive manager of Biosecurity Australia, discussing Australia's biosecurity policies, and Dr Ian Naumann, principal research scientist at the Office of the Chief Plant Protection Officer, at the Department of Agriculture, Fisheries and Forestry.

The last two days of the Council meeting involved visits to institutions in and around the Canberra region. On Thursday 25 March Council members met with representatives from CSIRO Land and Water, the Murray Darling Basin Commission, universities and ACT Forests to learn more about the relationships between ACIAR projects and Australia's Water Catchment Challenges. The following day was spent meeting with a range of representatives from the Department of Foreign Affairs and Trade, ABARE and the Australian National University discussing Australia's trade policy agenda and its relationship to ACIAR projects.

A presentation was also given by Mr Terry Davis, a reviewer of ACIAR projects involving World Vision, entitled 'Bridging the divide between agricultural R&D and community livelihoods: the World Vision/ACIAR perspective'. ■

ANNUAL OPERATIONAL PLAN

ACIAR's 2004-05 Annual Operational Plan (AOP) comes into effect on 1 July 2004. The AOP lays out research priorities for all ACIAR partner countries in which ACIAR operates, as well as available funding for project development.

The AOP is built around ACIAR's budget allocation for the 2004-05 financial year. Each year ACIAR receives a number of worthwhile project ideas, which need to be matched to the main priority areas for each country. Research Programs do not always operate in every country. The AOP defines which program areas operate in which country, and the research priorities for the area programs in those countries.

Readers will be able to use this country/ program presentation to determine research priorities and available funds ,when considering and developing project proposals.

The AOP also sets out internal priorities for Corporate Program areas, as well as key performance indicators for all areas of ACIAR.

A copy of the AOP, together with the priorities for each region, can be found on the ACIAR website at *www.aciar.gov.au*. Hard copies can be obtained by contacting ACIAR directly. ■

NEW APPOINTMENTS

PAPUA NEW GUINEA AND SOLOMON ISLANDS MANAGER

Margaret Newman is ACIAR's new Country Manager for Papua New Guinea and the Solomon Islands.

Margaret has joined ACIAR from the Department of Foreign Affairs and Trade, where she held a number of positions in Australian Embassies and Consulates overseas. She began her career as a teacher before joining DFAT as a communications officer.

Since then, Margaret has worked in a variety of representational, management and consular roles, in embassies in Rangoon, Burma, London, Paris, Belgrade and New Delhi. Other posts have included Charge d' Affaires in Almaty, Kazakhstan, and Deputy Head of Mission and Consul in Beirut, Lebanon.

Margaret has also undertaken short-term missions in Guangzhou and Hong Kong, Islamabad, Pakistan, Budapest and Prague where she was a member of the post opening team. Between postings, she worked in a number of roles within the Corporate Management Division and as desk officer for a number of European and East European countries in the Americas and Europe Division of DFAT in Canberra.

Margaret is looking forward to the opportunities that working with ACIAR has to offer: "ACIAR's mission in Papua New Guinea and the Solomons provides me the opportunity to meet and assist others in a very practical way, while at the same time extending my own knowledge and understanding of these countries and their peoples. It's challenging work but inspiring. There's something very rewarding about believing in what one is trying to achieve". ■

VIETNAM MANAGER

Misha Coleman joins ACIAR from Care International in Vietnam, where she was responsible for project design and implementation, strategic sectoral development and technical advice on a broad range of public and environmental health issues – including the recent Avian influenza epidemic.

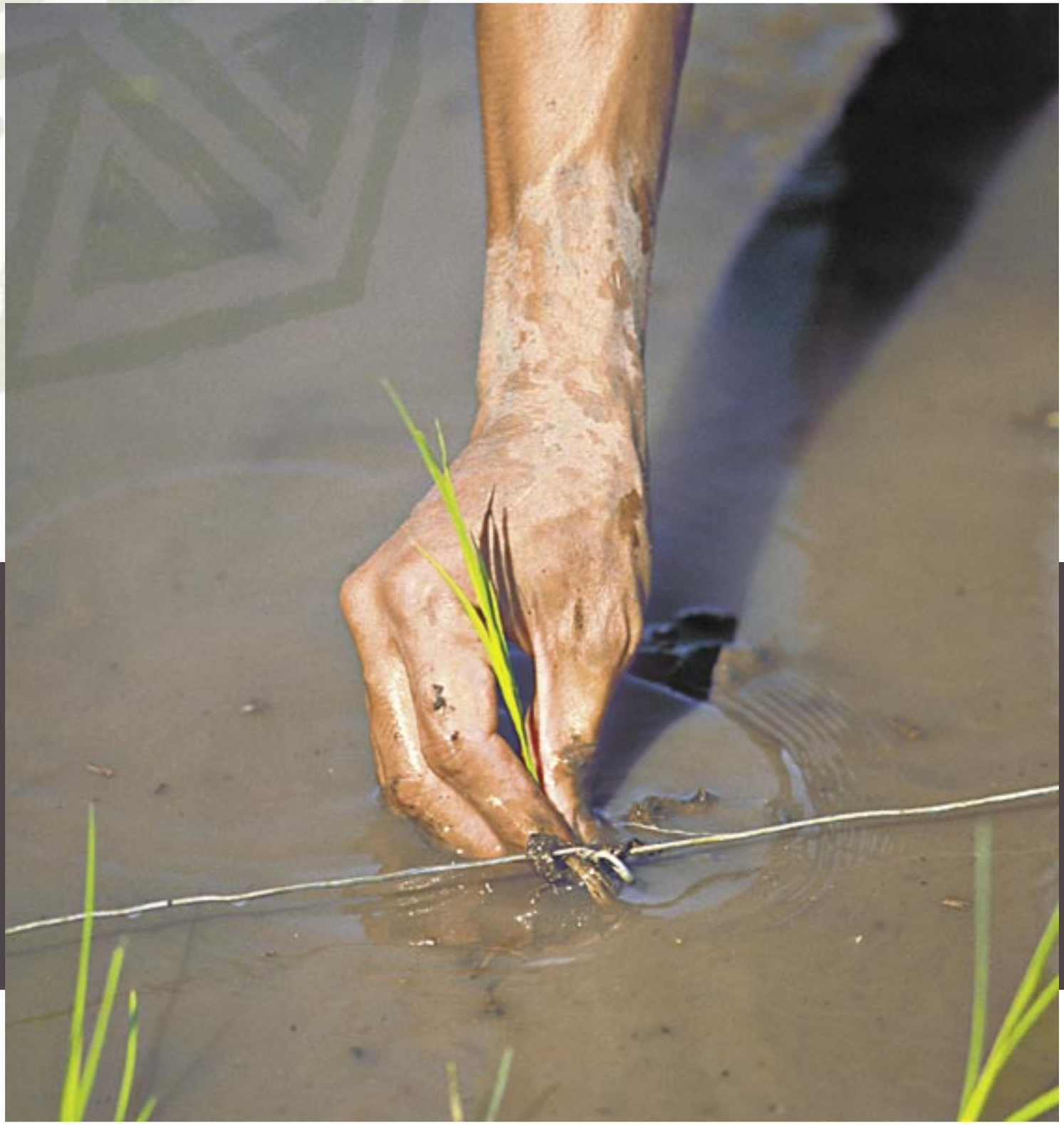
Misha has worked and studied in the Mekong Region since 1995 and has published on various socio-environmental issues. Most recently, she worked for three years in Cambodia in the public health sector. Misha has also worked for AusAID in Bougainville, Papua New Guinea and in Canberra, as the Environment Sector Officer on the Philippines Country Desk. She has worked in northern Australia with Aboriginal communities and in several townships in South Africa for the Health Department during apartheid.

Misha first went to Vietnam in 1996: "The economic reforms and associated growth in Vietnam over the past eight years have been truly impressive. Looking ahead, there are significant opportunities and challenges for the Government of Vietnam as it pursues further international agricultural trade expansion. For example, the impending WTO accession will facilitate an expansion in trade opportunities but a challenge will be to ensure that the poorest farmers also benefit.

"With 75 per cent of the population in Vietnam engaged in agriculture, ACIAR has enormous potential to assist the Government of Vietnam to improve agricultural outcomes, maximise agricultural trade opportunities in an environmentally sustainable way, and ultimately to reduce poverty in Vietnam. I am very pleased to be joining ACIAR at such an exciting time in the development of Vietnam". ■

ACIAR'S VISION

ACIAR looks to a world where poverty has been reduced and the livelihoods of many improved through more productive and sustainable agriculture emerging from collaborative international research.



The Australian Centre for International Agricultural Research (ACIAR) operates as part of Australia's international development cooperation program, with a mission to achieve more productive and sustainable agricultural systems, for the benefit of developing countries and Australia. ACIAR commissions collaborative research between Australian and developing country researchers in areas where Australia has special research competence. It also administers Australia's contribution to the International Agricultural Research Centres.

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